

The Fisheries Co-Management Guidebook

Emerging research for the effective
management of small-scale fisheries



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Table of Contents

ACKNOWLEDGEMENT	03
BACKGROUND	04
PURPOSE	05
WHAT IS FISHERIES CO-MANAGEMENT?	
1.1 What are small-scale fisheries?	07
1.2 What is co-management?	08
ETHICS, LAW, AND PRINCIPLES	
2.1 Human rights	10
2.2 Equity and justice	11
2.3 Gender equality	12
2.4 Diverse knowledge systems	13
2.5 Sustainable Indigenous management	14
FISHERIES MANAGEMENT	
3.1 Diverse fisheries	16
3.2 Diverse objectives	17
3.3 Diverse strategies	18
3.4 Life-history and ecology	19
3.5 Larval connectivity and permanent closures	20
3.6 Nutrition sensitive fisheries management	21
SOCIAL STRUCTURES	
4.1 Local context	23
4.2 Roles and responsibilities	24
4.3 Commons design principles	25
4.4 Human behaviour	26
4.5 Co-management adoption and spread	27
MANAGING FOR IMPACT	
5.1 Impact	29
5.2 The triple bottom-line	30
5.3 Monitoring and evaluation	31
5.4 Connecting implementation to impact	32
FURTHER READINGS	33

Acknowledgements

We acknowledge the interdependence of nature and people – that biological and cultural diversity are interconnected and mutually reinforcing. We acknowledge that Indigenous peoples and local communities frequently represent the most active defenders of nature, and we believe that respecting and protecting their rights is the best pathway to achieving durable conservation impact. We also acknowledge the Traditional Owners and Custodians of the land and sea on which we live and work, and pay our respects to their Elders, past, present, and emerging.

This work was undertaken through a growing partnership between the Wildlife Conservation Society and WorldFish, aiming to increase collaboration between conservation and development sectors. This partnership represents a milestone towards integrated approaches for the benefit of both ecosystems and local communities. Support was provided by the CGIAR Initiative on Aquatic Foods, the Constantine S. Niarchos Marine Conservation Fellowship Program, the Crawford fund, and the Australian Research Council Centre for Excellence in Coral Reef Studies at James Cook University.

Background

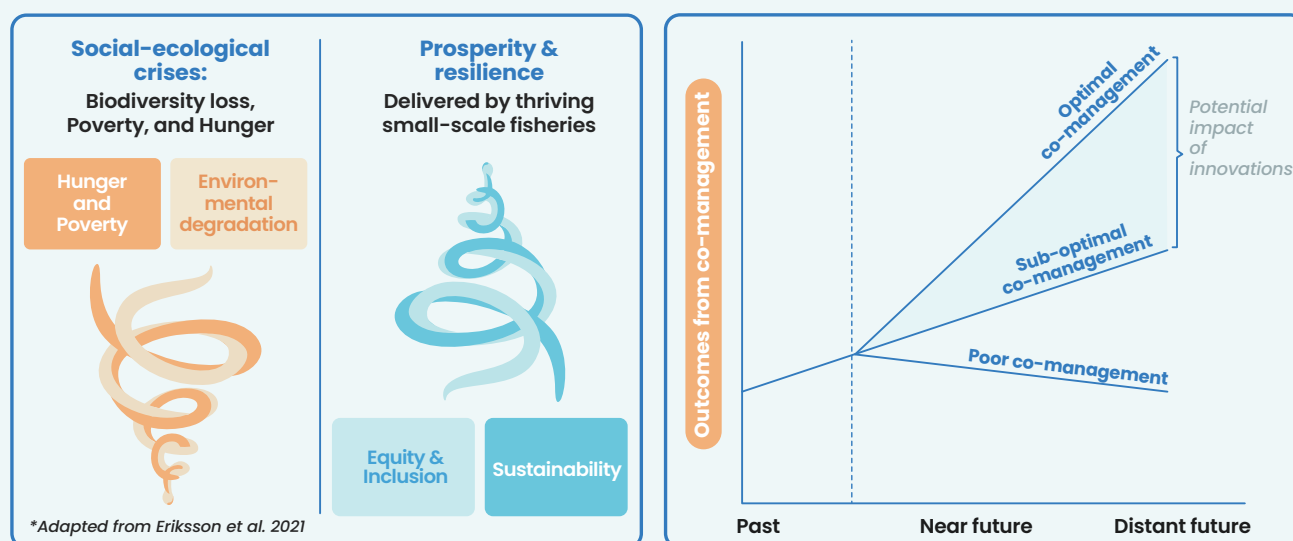
Small-scale fisheries account for 40% of global fish catch and employ more than 90% of the world's fishers. 492 million people depend at least partially on small-scale fisheries for their livelihoods and food and nutrition security, including Indigenous peoples, Afro-descendants, and religious and other minorities in coastal and riverine communities. As such, this sector defines the livelihoods, nutrition, and culture of a substantial and diverse segment of humankind, as well as being of global significance for ocean sustainability.

In 2014, the Food and Agriculture Organization of the United Nations released the **Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries**, the first internationally agreed instrument dedicated to the small-scale fisheries sector. Centred on a human rights-based approach, these guidelines were developed through a participatory and consultative process that aims to support the effective management of small-scale fisheries. Yet managing small-scale fisheries is inherently complex, and top-down approaches to small-scale fisheries management have faced many obstacles. In recent decades more local forms of marine management, including fisheries co-management, have captured global attention as the most appropriate mechanisms to manage small-scale fisheries.

Fisheries co-management is a relationship between resource-users such as fishers or a fishing community and another organization or entity (often a government agency) for the purpose of managing a fishery. It is a collaborative arrangement where both groups have some responsibility and authority. This approach is now widely considered to be the most appropriate, fair, and effective form of governance for small-scale fisheries. It is envisioned as a process by which to reverse the interconnected crises of hunger, poverty, and biodiversity loss, transforming small-scale fisheries into engines of prosperity, inclusion, and sustainability.

This guidebook aims to provide practitioners with the information required to drive positive impacts from fisheries co-management.

Figure 1. Fisheries co-management is envisioned as a process by which to reverse the downward spirals of social-ecological crises, transforming small-scale fisheries into engines of prosperity, inclusion, and sustainability (adapted from Eriksson et al. 2021).



Further reading, see references:

FAO 2014.

FAO, Duke University & WorldFish 2023.

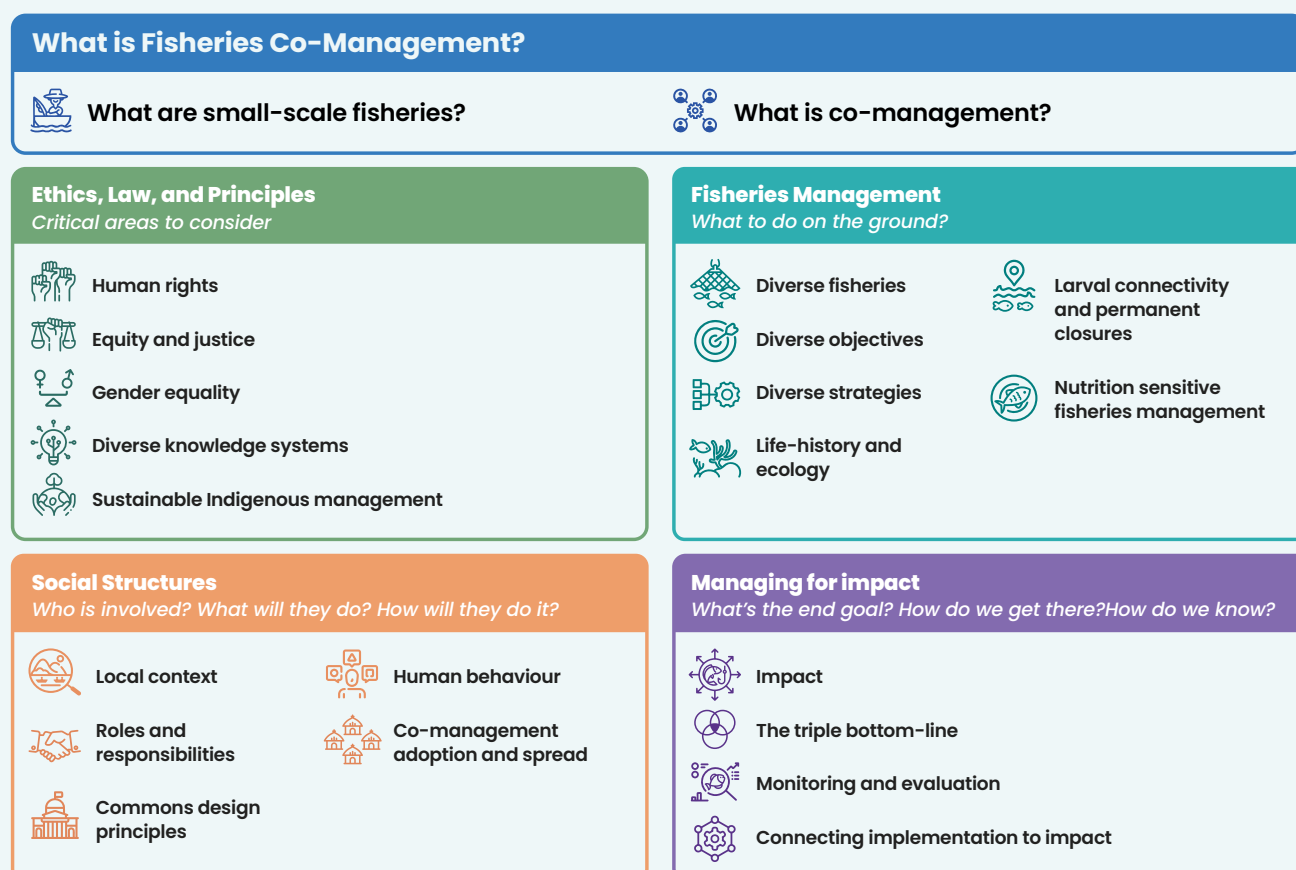
Purpose

Fisheries co-management will continue to grow. Yet co-management can succeed or fail, and implementation does not mean positive impacts for food security, nutrition, livelihoods, or biodiversity. Nor does it imply programs will respect human rights, gender equality, or principles of justice and equity. Fewer management programs implemented well might achieve far more than many implemented poorly, and poorly implemented co-management can be worse than no management.

This guide was designed to assist practitioners in understanding the latest research on what constitutes successful fisheries co-management, and how to reach this objective. The aim is to synthesize emerging research that, if adopted, would substantially improve impacts across both ecological and social dimensions. The guide is presented as an infographic series with each infographic summarizing a substantial body of research from a particular field.

This guide is divided into five sections. Section one – *What is fisheries co-management?* - defines small-scale fisheries and co-management. Section two – *Ethical principles* – outlines ethical considerations that should form the basis of any program. Section three – *Fisheries management* – outline specific management strategies, ecological considerations, and how they can be applied to achieve certain objectives. Section four – *Social structures* – discusses the social contexts and processes surrounding any co-management system. Section five – *Managing for impact* – outlines the processes required to understand whether management is making a difference. Each infographic also includes reflection questions that ask the reader to imagine how they would apply this information in a small-scale fisheries with which they are familiar, as well as suggested further reading.

Figure 3. The main sections of the guidebook.





What is fisheries co-management?

The FAO Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries (top) and the Illuminating Hidden Harvests report (bottom) are two key documents for understanding the definitions of, and contributions by, the small-scale fisheries sector.





What are small-scale fisheries?

~40%
of global fish
catch

37
million tonnes
of marine and
inland catch

US \$77
billion annual
revenue

~90%
of people
employed in
capture fisheries

60
million people in
full- or part-time
roles

45
million women
participate

492
million people
dependent at
least partially for
income

2/3
of the fish
caught for human
consumption

5.8
million small-scale
fishers earn less
than \$1 per day

IMPORTANT FOR


Gender Equality


Livelihoods


Nutrition

Small-scale fisheries engage approximately **90% of the women and men** who are involved in fishing around the world, and contribute **40% of global catch** and **two-thirds** of all fish caught for human consumption.

Small-scale fisheries are typically small operations occurring in lakes, rivers, and along coasts. Fishers may be **self-employed**, involved in locally-based artisanal fishing - **commercial or subsistence** - encompassing **all activities along the supply chain**. Fishers often include Indigenous peoples, Afro-descendants, and religious and other minorities in coastal and riverine communities. Small-scale fisheries typically involve women and men who use small amounts of capital and energy, relatively small fishing vessels, if any, fishing close to shore for relatively local consumption.

Small-scale fisheries provide **food and nutrition security, employment** and other multiplier effects to local

economies, and tend to be firmly rooted in local communities, traditions and values, whilst some operations embrace modern technologies for safety, marketing, and efficiency purposes.

Many small-scale fishing communities also **actively manage** coastal areas and fish stocks. Small-scale fisher groups have been pivotal in drafting inclusive oceans, food, and water governance policies. However, in many fora small-scale fishers and their concerns tend to be marginalized from dialogue between international actors with strong political and economic influence, such as energy, mining, tourism, and conservation.

Further reading, see references:

FAO 2015.

FAO 2023.

Cohen et al. 2019.



Fisheries co-management is a relationship between a resource-user group, such as fishers or a fishing community, and another organization or entity (often a government agency) for the purpose of managing a fishery. It is a collaborative arrangement where both groups have some responsibility and authority. Other common terms used that often also infer co-management include community-based marine management, community management, and local marine management.

Through this approach, the **management partners** (e.g., government, NGOs, civil society) support the **resource users** (e.g., communities) in designing, implementing, and regulating management arrangements. Further support and assistance are often provided from other stakeholders like boat owners or fish traders, as well as by external agents like NGOs and research institutions.

Co-management can take many different forms in terms of the resources being managed, the rules by which they are managed, the people and groups involved in management, and the relationships between management partners and resource users. These relationships typically occur along a spectrum from "instructive" management, where fishers are directed to follow certain rules, to "informative" management where most authority belongs to the resource users who then may seek advice from management partners.

Co-management is now widely considered to be the most appropriate, fair, and effective form of governance for small-scale fisheries.

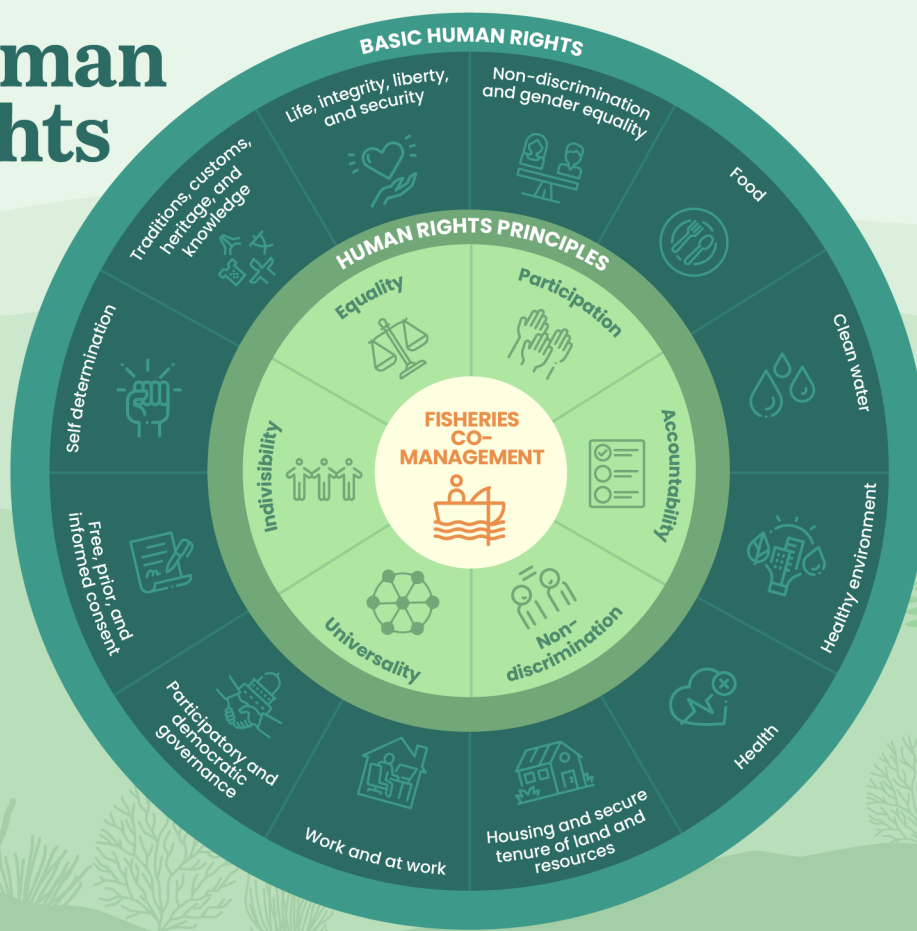
Further reading, see references:

Jentoft et al. 1998.
Pomeroy and Williams 1994.
Sen and Nielsen 1996.

Ethics, Law, and Principles



Human rights



Human rights recognize the inherent value of each person. They are **universal, inalienable, and unconditional**. This means they are held equally by everyone, they cannot be taken away, and do not depend on behaviour. Human rights are based on principles of **dignity, equality, mutual respect, and are shared across cultures, religions, and philosophies**.

Duty bearers, the actors responsible for the realization of rights, have a responsibility to respect, protect, and fulfil the rights of **rights holders**. This means duty bearers refrain from actions that violate rights, prevent the violation of rights by others, and enable people to claim and enjoy their rights. In the context of small-scale fisheries, rights holders are generally the fishers, fish-workers, and fishing communities involved at all points along the value chain, while duty bearers are typically the government, but can also include NGOs and other organizations supporting co-management.

There are **legal and ethical obligations**, as well as **practical benefits**, for co-management to support human rights. First, international law requires both governments and organizations to respect human rights as the bottom

line. Second, it is also ethically wrong for one people to dispossess and subjugate another people to promote their own ideological views. Third, mounting evidence also shows many practical benefits for how supporting the rights of local people leads to positive and enduring impact for both people and nature.

Human rights therefore should act as the foundation on which fisheries co-management exists.

Reflection questions:

- What human rights might be affected by this fishery?
- Who are the duty-bearers and rights-holders in this fishery?
- What are the human rights responsibilities of the duty-bearers?
- Is there more we could be doing to support human rights?

Further reading, see references:

Allison et al. 2012.
 Newing and Perram 2019.
 Smallhorn-West et al. 2023.
 Universal declaration of human rights
 Declaration on the Rights of Indigenous Peoples



Equity and justice

Distributional Equity

Fair distribution of costs and benefits



Procedural Equity

Fair decision-making process



Recognitional Equity
Acknowledging and respecting sociocultural diversity

Fisheries co-management can benefit, or disadvantage, specific people and sectors of society in different ways. This can result in increased power imbalances, with costs disproportionately falling on those with the least power.

Equity generally refers to what is right and fair. This means being equitable not only in how benefits and costs from co-management are distributed, but also the process of decision making – ensuring the fair treatment of all people involved. Enabling this process also means understanding whose views, identities, and interests are seen as legitimate, respected, and valued.

Intersectionality recognizes that people's lives are shaped by their identities, relationships, and social factors. These combine to create intersecting forms of privilege and oppression depending on a person's context and existing power structures such as patriarchy, ableism, colonialism, imperialism, homophobia, and racism.

For example, in many instances where equity isn't considered, co-management can facilitate, rather than restrict, local elites capitalizing on opportunities and making decisions on behalf of communities, and therefore widen inequities.

Co-management does not guarantee that all members have their views heard and respected. Working towards just co-management might require challenging discriminatory social norms, cultural practices, or laws. Working towards equitable co-management means acknowledging differences in circumstances and allocating resources and opportunities accordingly.

Reflection questions:

- How are the resources from co-management distributed among the community?
- Is this distribution fair, or are some people disadvantaged compared to others?
- Are everyone's views equally heard, valued, and understood?

Further reading, see references:

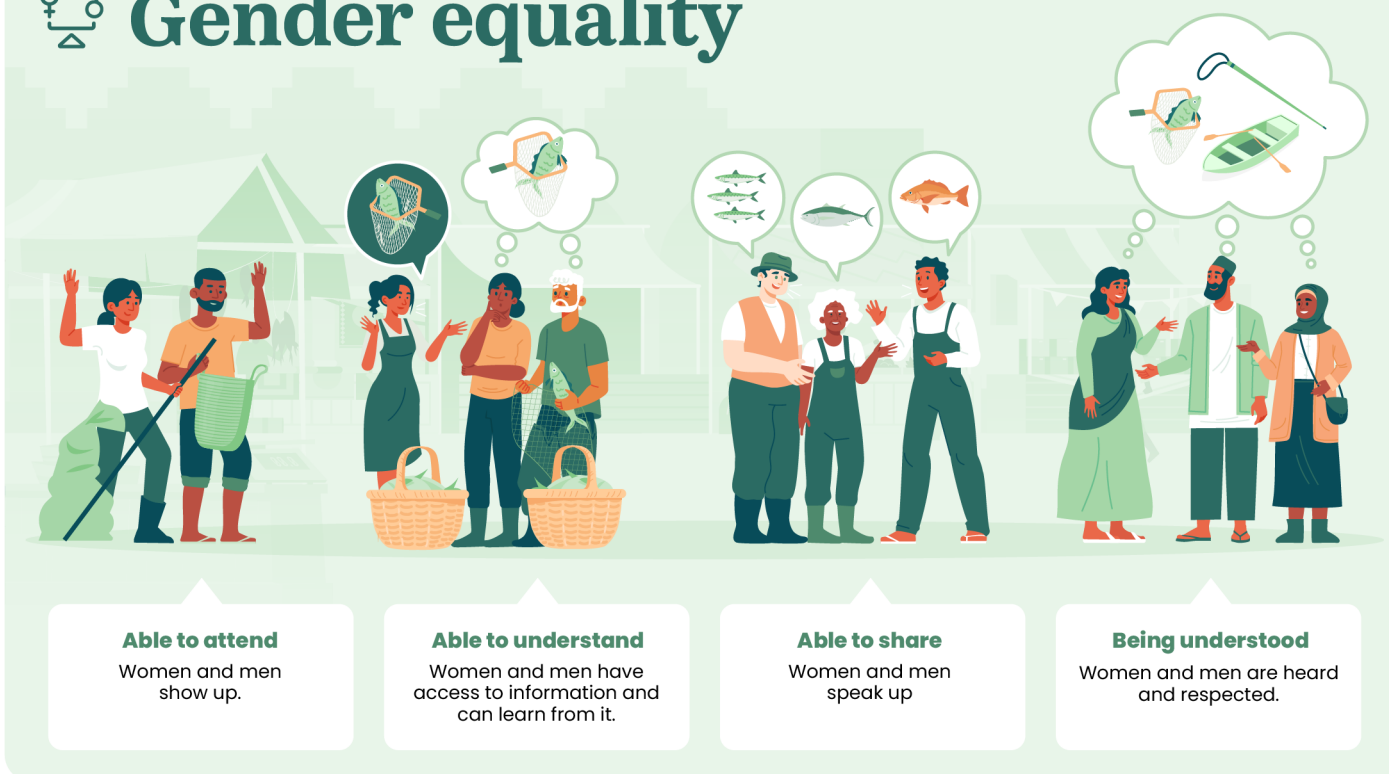
Bennett 2022.

Gurney et al. 2021.

Vunisea 2008.

[FAO guide on Intersectionality](#)

Gender equality



Gender equality is fundamental for just and equitable fisheries. Gender refers to the social, psychological, cultural, and behavioural aspects of being a women, man, or other gender identity. These expectations profoundly influence the experiences, opportunities, and barriers of people in small-scale fisheries.

In small-scale fisheries, progress on gender equality can lead to **improved social outcomes**, such as economic empowerment, and **ecological outcomes**, such as improved biodiversity.

Despite women's high participation in small-scale fisheries, they are consistently undervalued, underrepresented and marginalized in formal (e.g., government policy) and informal (e.g., community decisions) settings. Men tend to hold greater influence in decisions related to access, use and management of productive assets, and are more likely to capture and control a disproportionate share of the social and economic benefits.

Gendered approaches to small-scale fisheries research, policy, and practice present diverse **opportunities to address the challenges** across many gender identities.

For instance, data collection is increasingly becoming sex-disaggregated and analyses increasingly show

differences in freedoms, rights, and opportunities in the sector.

Greater understanding means management measures can be **designed to respond to gender differences**, such as capacities of women and men to access fisheries extension services and support structures.

At the frontier of best practice are **gender transformative approaches** that target the root causes of gender inequality by transforming inequitable social structures and institutions.

Reflection questions:

- Does management account for differences in access, use, and decisions about fisheries resources?
- What opportunities are there to approach co-management in a more gender equitable way?
- In what ways could we use fisheries co-management to transform inequitable social structures?

Further reading, see references:

Barclay et al. 2021.
Harper et al. 2022.
Lawless et al. 2021.
Mangubhai et al. 2022.

Diverse knowledge systems



Evidence and information come in many forms. The lived realities of fishing communities can be a substantial source of evidence based on deep, enduring interactions with resources. At the same time, scientific research based on careful analysis of patterns is also crucial for sustainable management. **Respect, listen to, and consider all viewpoints and knowledge types, including local, Indigenous, scientific, social, and institutional knowledge.**

Knowledge co-production combines scientific learnings with other knowledge systems to generate stronger evidence. This evidence then enhances the legitimacy of findings, enabling decision-makers to make better-informed decisions.

But knowledge co-production also means acknowledging the biases all humans are prone to, both within western scientific thought and local knowledge systems. For

example, many western scientists still do not understand the diversity of values other cultures have for nature. Likewise, some fishing communities might not fully understand the time it takes for fish populations to recover from overfishing. Disregarding biases that all humans experience undermines the sustainability of fisheries co-management.

Reflection questions:

- Where is our knowledge coming from?
- Are we giving enough respect to other knowledge systems?
- What biases could we be prone to?

Further reading, see references:

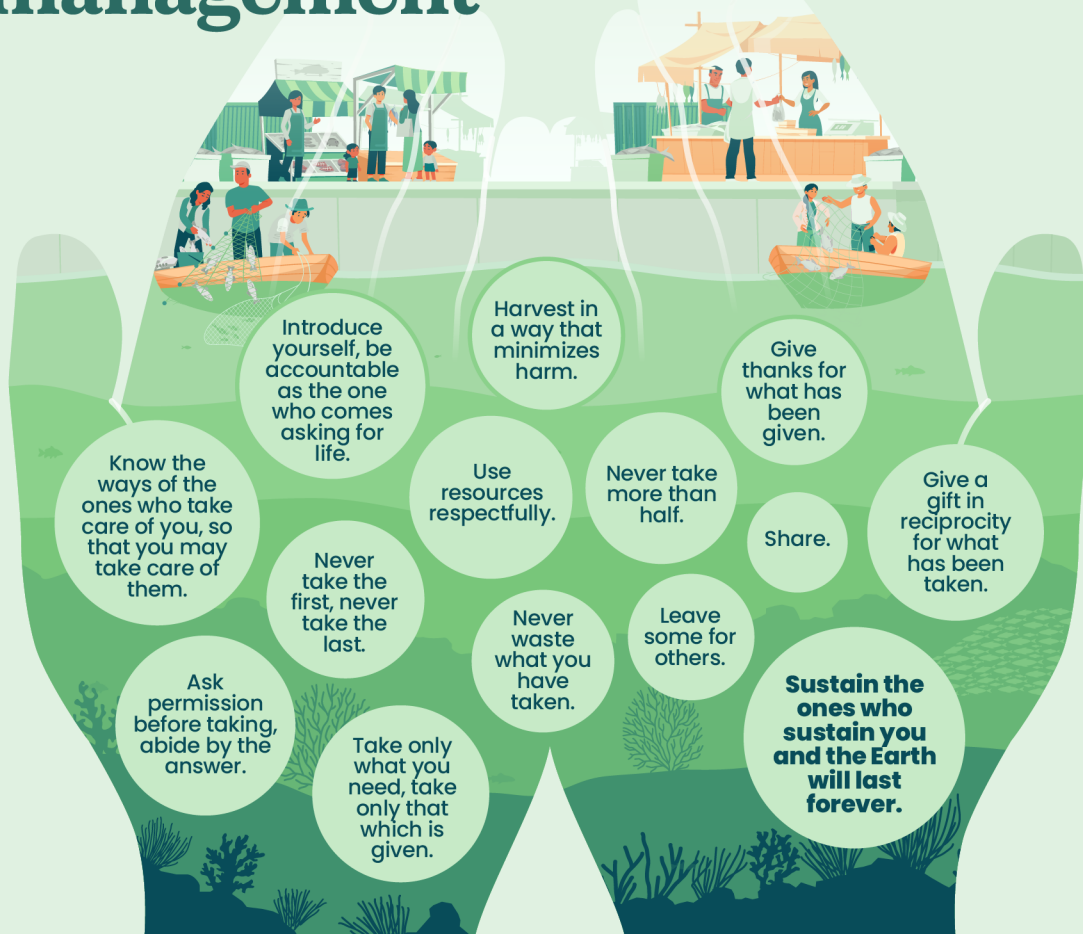
Allison et al. 2020.

Chambers et al. 2021.

Muradian and Pascual 2018.



Sustainable Indigenous management



The principles and practices in **Indigenous science, philosophy, lifeways, and stories**, govern the exchange of life and shape relationships with the natural world. They rein in tendencies to overconsume so that harvests can be sustained for future generations. For example, the **Seventh Generation Principle of the Iroquois Nation** urges us to consider our impacts on the seventh generation into the future.

Collectively, this can be known as the **Honorable Harvest**. While details are specific to different cultures and ecosystems, the fundamental principles are often shared among peoples living close to land and sea country.

The Honorable Harvest recognizes beings harvested – such as fish or shellfish – as ‘persons’, nonhuman, but still vested with awareness, intelligence, and spirit. In this view, killing a **who** demands greater care than killing an it.

The Honorable Harvest offers a model for what we should

take and how, so that we do justice to the lives that are taken.

While not a legal policy, it is nevertheless an agreement between consumers (such as fishing communities) and providers (such as aquatic animals). These practices are designed to maintain the health of species and ecosystems, and like government regulations, are based on sophisticated ecological knowledge and long-term monitoring of populations.

Reflection questions:

- Are our harvesting strategies respectful of the individuals being harvested, and those left behind?
- Is our harvesting strategy sustainable?
- Will resources still be available for future generations?

Further reading, see references:

Boyko and 'Aulani 2022.

Foale et al. 2016.

Kimmerer 2013.

Fisheries Management



Diverse fisheries

Diverse Habitats

- Inland
- Coastal
- Estuarine
- Pelagic
- Coral reefs

Diverse Methods

- Hand line
- Trap
- Net
- Gleaning
- Fixed gear
- Spearfishing

Diverse Species

- Fish
- Invertebrates
- Plants
- Algae



Small-scale fisheries are extraordinarily diverse. They cover a wide **range of habitats**, using **many methods** to catch **thousands of species**.

Successfully managing small-scale fisheries therefore begins with understanding how this diversity will be addressed. As a first step, it is important to know the **habitats** that are being managed, the **methods** employed for harvesting, and the **species** being harvested.

For example, a typical small-scale fishery in **Fiji** could involve mangrove and coral reef habitats, the use of gleaning and spearguns, and the harvesting of molluscs and reef fish.

A common small-scale fishery in **Bangladesh** might involve fishing in riverine deltas, using gill nets, and harvesting *hilsa* fish.

And a small-scale fishery in **Canada** could involve rock pool and intertidal habitats, using knives and gloves, and harvesting kelp and sea urchins.

Making sense of this diversity allows the appropriate management strategies to be implemented in order to reach the target objectives.

Reflection questions:

- What habitats are most commonly fished in this fishery?
- What gears and methods are used the most in this fishery?
- What species are being caught most in this fishery?

Further reading, see references:

Andrew et al. 2007.

McClanahan et al. 2007.

McClanahan et al. 2022.

Diverse objectives



Fisheries co-management aims to deliver benefits across a broad range of **objectives**. These objectives can be broadly summarized using the **UN Sustainable Development Goals (SDGs)** and most consistently include:

- **No Poverty** (SDG 1)
- **Zero Hunger** (SDG 2)
- **Gender Equality** (SDG 5)
- **Sustainable Communities** (SDG 11)
- **Life Below Water** (SDG 14)

Within these broad goals are specific objectives that can be explicitly economic, social, or ecological. For example, co-management might aim to prioritize **economic objectives** such as reducing poverty and increasing short-term yields. Other managers might prioritize **social objectives** such as ensuring full and effective participation, safeguarding cultural heritage, and reducing all forms of malnutrition. And others might prioritize **ecological objectives**, such as restoring fish stocks, conserving biodiversity or increasing ecosystem resilience.

Importantly, all objectives have merit, and their relative importance will depend on the values of those engaged in co-management. While the ultimate aim should be to improve outcomes across all dimensions, in practice specific strategies can lead to better outcomes for specific objectives and may create trade-offs for achievement of conflicting objectives. Moreover, the pathways between implementation and impact are not always clearly defined (see p. 32).

Reflection questions:

- What are the main objectives we hope to achieve from fisheries co-management?
- Will others also share these same objectives?
- Are there additional objectives that we might be missing?

Further reading, see references:

Cohen et al. 2014.
Jupiter et al. 2014.
Smallhorn-West et al. 2022.



There are many strategies that can be used for fisheries co-management. They all function by regulating patterns of resource use in space and time in a variety of ways, such as through spatial restrictions, or restrictions on the gears used or the species targeted.

Access restrictions are a spatial strategy limiting who can harvest resources from within a certain area. The ability to restrict access is usually the first indicator of the right to manage (i.e., the ability to apply other management strategies).

Permanent closures are a spatial strategy prohibiting harvesting within boundaries, reducing overall pressures across the system or concentrating it elsewhere.

Periodic closures (including temporal, non-permanent, and rotational) are a spatial strategy limiting harvesting within an area to certain times, such as for special events or only at specific times of year.

Species restrictions include size limits, bans on certain species, or bans at certain times or locations on specific species (e.g., spawning aggregations).

Gear restrictions place limits on fishing methods and equipment, typically those that are either destructive

(e.g., dynamite and poison) or highly efficient (e.g., spear guns or small mesh nets).

All strategies have certain benefits, but also some drawbacks. Some strategies are better suited for specific objectives, and for specific species. For example, permanent closures typically offer the greatest opportunities for species recovery within their boundaries, but may come at a cost for fisher livelihoods or nutritional security. Care must be taken to match strategies to the specific fisheries as well as the desired objectives.

Reflection questions:

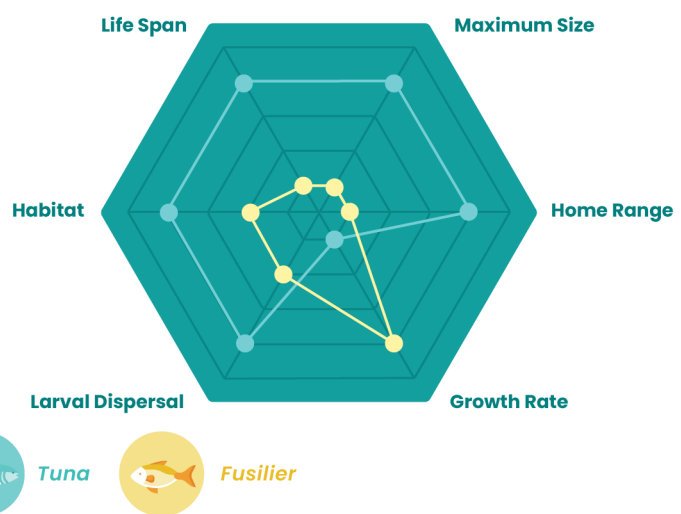
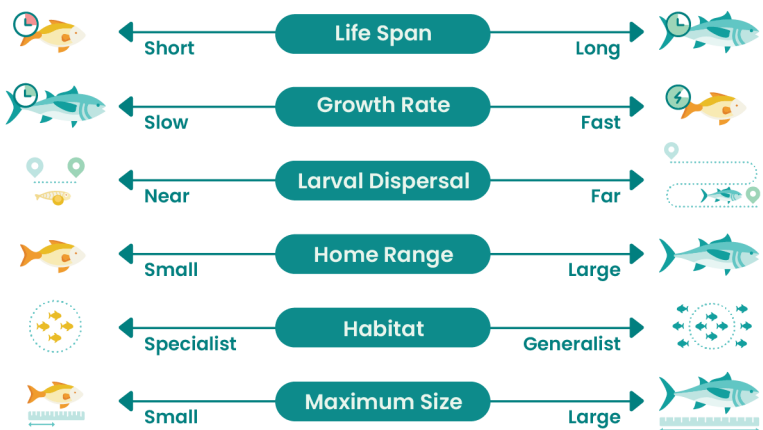
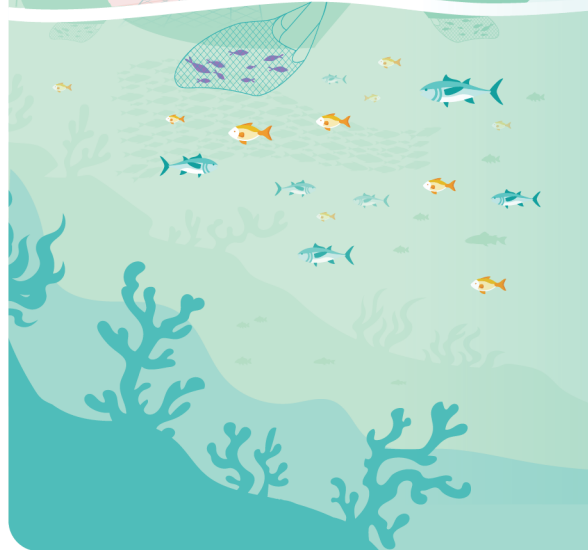
- What strategies are available to manage this fishery?
- Will the strategies we are using help us achieve our objectives?
- What are the benefits and weaknesses of the strategies we are using?

Further reading, see references:

Cinner et al. 2006.
Jupiter et al. 2014.
Smallhorn-West et al. 2022.



Life-history and ecology



The **life-history** of marine species are the collective strategies by which they **age, grow, move, and reproduce**. These patterns vary widely between species and this dictates which co-management strategies should be used and how. Some species reach maturation within a few months and then reproduce several times each year. Others take decades to become mature and then only reproduce sporadically.

Species are considered more **vulnerable** to overfishing if their life-history demonstrates slow growth, late maturation, long lifespans and fewer offspring, or specific habitat requirements. The more vulnerable a species is, the longer and more restrictive co-management strategies need to be for species to recover. For example, a fisheries closure that allows one month of fishing per year might work well for fast growing species but might be harmful for slow growing species.

The harvesting cycles, lengths of closures and sizes of management must therefore match species' life-history,

maturation, spawning times, and home ranges. If management strategies don't align with these characteristics, then it is unlikely that the resource harvesting will be sustainable.

Managers must keep in mind that regardless of the social implications, **species life-histories are unchangeable**.

Reflection questions:

- What are the life-history characteristics of the target species?
- What are the strategies being used to manage the target species?
- Do the management strategies align with the life-history of the species we are harvesting?

Further reading, see references:

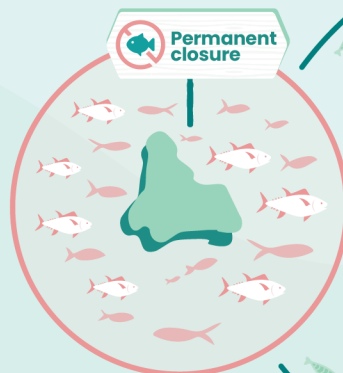
Abesamis et al. 2014.
Green et al. 2014.
Lavin, et al. 2021.
Weeks, et al. 2017.



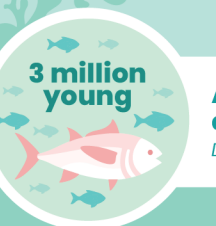
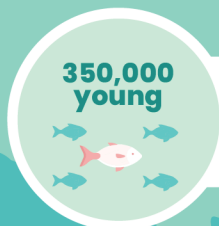
Larval connectivity and permanent closures



Fully-grown, large fish produce exponentially more eggs than smaller fish



In one study, 28% of a local reef was protected, producing 50% of juveniles in fished areas.



Average numbers of young produced by three different sizes of coral trout.

Data: Goeden (1978) Queensland Fisheries Services Research Bulletin

Permanent closures that prohibit fishing within their boundaries can act as important **fisheries management tools**. This is because recovering fish populations within permanent closures provide a consistent source of **larval export** to areas beyond their boundaries.

When fish reproduce, they release eggs and sperm into the water column. This means that fish within permanent closures can produce offspring that drift into openly fished areas before settling. Importantly, large fish tend to produce exponentially more eggs than fish even a little smaller.

For example, one study found that the number of fish exported from permanent closures to openly fished areas was nearly **double** what was given up for fishing, meaning a net benefit for the fishery as a whole.

From a fisheries perspective it is therefore important to always leave part of an area closed to fishing. This is because the recovery of fish populations within permanent closures

can take a long time but decline rapidly once opened to fisheries activities.

The good news is that permanent closures can be flexible to changes in reserve size and spacing, while still providing important fisheries and conservation benefits.

Reflection questions:

- Do we understand the connectivity benefits of this permanent closure?
- Is the permanent closure old enough for the fish inside to be providing fisheries benefits?
- If we open a closure to fishing, will we be trading long-term for short-term benefits?

Further reading, see references:

Almany et al. 2007.
Harrison et al. 2012.
Jones et al. 1999.
Harrison et al. 2020.



Nutrition sensitive fisheries management

Iron

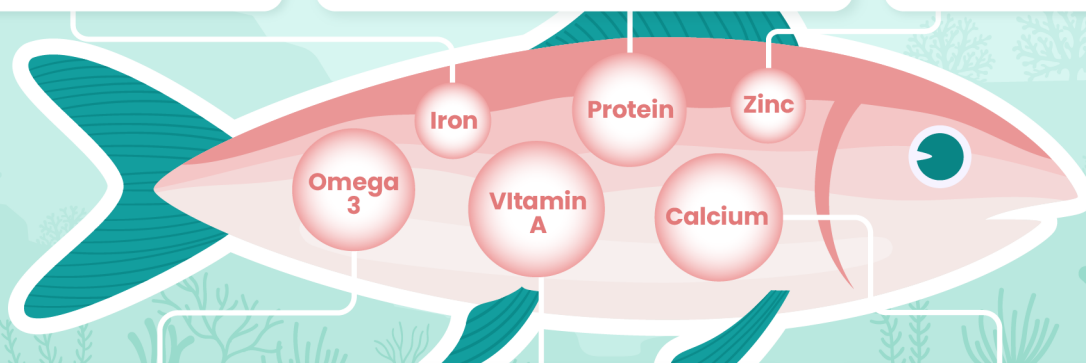
is essential for brain development in children and increases maternal survival rates.

Protein

is a component of every body cell, important for growth and repairing, supporting neurological function, digestion, and hormones.

Zinc

is crucial for childhood survival, reduces stunting in children and fights diarrhea.



Omega 3

Omega 3 fatty acids

is crucial for brain development, cognition and immune system, reducing risk of coronary heart disease and stroke.

Vitamin A

Vitamin A

is essential for childhood survival, prevents blindness, helps fight infections, and promotes healthy growth.

Calcium

Calcium

helps prevent preeclampsia and preterm delivery in women, and is essential for strong bones and teeth.

Fish consumption can...



Lower the risk of cardiovascular-related illness.



Support immune system function.



Enhance the nutritional quality of breastmilk and maternal and infant health outcomes.



Provide one of the only dietary sources of vitamin D.



Serve as a micronutrient supplement for women and children in the first 1000 days of life.

Aquatic foods are a significant source of **essential micronutrients** for more than **four billion consumers** and provide more than **one sixth of global demand for animal protein**. But it is also estimated that nearly **two billion people lack key micronutrients**, underlying nearly **half of all deaths under five years of age**. **Nutrition sensitive** approaches to co-management recognize that where incomes are low, poverty is high, and food choices are limited, small-scale fisheries are particularly important to food security and human health. Co-management must consider the costs and gains it may have on food security, as well as other aspects of food sovereignty (e.g., culture).

Nutrition sensitive co-management means designing programs **inclusively** to increase control for local co-managers (i.e., communities, groups of fishers) over a resource. Managing for nutrition can sometimes be at odds with managing for economic gains, and this control can protect local food provision over commercial uses. Nutrition sensitive co-management also means ensuring

any short-term loss of access to fishing is given with consent and managed in a way that **"does no harm"**. It also means thinking holistically - addressing additional factors such as health services, water quality and sanitation, and food knowledge and preparation.

Reflection questions:

- Are communities food secure?
- Will any co-management actions jeopardize people's health?
- What other factors beyond co-management could also be supported to improve nutrition?

Further reading, see references:

Hicks et al. 2019.
Robinson et al. 2022a.
Robinson et al. 2022b.

Social Structures



Local contexts



10 socioeconomic factors influencing the impact of fisheries co-management

Each community involved in co-management is unique. Communities differ widely across many **social, economic, political, and cultural contexts**, and these differences influence the impacts of co-management. Some of these **contextual factors** can be external to the community, such as their distance from markets. Others can be more internal, such as levels of dependence on local fishing grounds, or the cohesiveness of the community.

For example, the strength of co-management programs is tightly bound to levels of community engagement, as well as local ecological knowledge and customs. Likewise, market access and population pressure are important predictors of whether co-management improves fish stocks, or increases over-exploitation. The contexts in which fisheries co-management operate are therefore

just as relevant as the specific strategies that are employed.

Reflection questions:

- How would you describe the social, economic, political, and cultural context of this community?
- Will any of these factors affect how this community engages in co-management?
- Which co-management strategies are most suitable based on the characteristics of this community?

Further reading, see references:

Brewer et al. 2012.
Cinner 2005.
Cinner et al. 2018.



Roles and responsibilities

Local communities



Government



Co-management involves actions by both **external actors**, such as government and NGOs, and the **community**. As such, successful co-management requires clear delineation and support for the specific roles and responsibilities of each party. These roles exist along a continuum of governing responsibility and power and are often nested with specific roles in local, national, and regional contexts.

In co-management, the **responsibilities of the resource users** are to have **sufficient interest and willingness to engage, knowledge of the system, and enough organization to enable collective action**. They also need the commitment to complete specified roles like enforcement or data gathering.

The **responsibilities of management partners** are to **foster the conditions for co-management by creating legitimacy and accountability for local organizations through recognition of rights and rules** as well as ensuring effective institutional processes and workflows.

Ideally, co-management complements the capacity and aspirations of local fishers and community with the abilities

of government to provide enabling legislation, aid in management, and provide oversight.

Supporters of fisheries co-management also need to be realistic about the capacity for each level of governance to deal with the scale of various issues. For example, investments at the local scale are unlikely to address global challenges such as climate change, which require bold actions from international actors. Likewise, targets set at regional or national levels, for example to combat overfishing, generally have limited influence on local patterns of resource use.

Reflection questions:

- Do communities understand their responsibilities, and those of their partners?
- Do partners understand their responsibilities, and those of the communities?
- Are the issues being managed at the right scale?

Further reading, see references:

Plummer et al. 2012.

Pomeroy and Berkes 1997.

Sen and Nielsen 1996.



Commons design principles



Clear group and resource boundaries



Rules fit local circumstance



Decision making is participatory



Monitoring of resources and compliance



Graduated sanctions for rule violators



Dispute resolution is fair and effective



Right to organize is respected



Nest local management within larger governance structure

Common pool resources are those that are available to everyone, but for which controlling access is difficult. These are also called open access systems, and can include fisheries, forests, groundwater basins, and even global greenhouse gas emissions.

The '**tragedy of the commons**' refers to situations where individuals acting in their own self-interest over-exploit common-pool resources. For example, the incentive to overfish can occur if everyone can access a fishery with no regulations, since fish that one person wants to save can just be caught by someone else. **The 'tragedy of the commons' is one of the key challenges for open-access fisheries.**

Research has identified a series of **design principles** that enable institutions to effectively manage common-pool resources, including fisheries co-management, and avoid the 'tragedy of the commons'.

These eight principles include having **clearly defined**

users and resources, graduated sanctions for rule violations, and strong **conflict resolution mechanisms**. These principles work to increase the legitimacy of co-management institutions, since people need to believe that the rules of fisheries co-management are fair in order to follow them. Thus, they need to respect the leaders and institutions making the rules.

Reflection questions:

- Is our fishery subject to the 'tragedy of the commons'?
- Are all eight design principles present in this co-managed fishery?
- How can we improve the presence of some of these design principles?

Further reading, see references:

Cox et al. 2010.

Hardin 1968.

Ostrom 1990.



Human behavior



Cognitive biases

Status quo

Most people prefer to maintain the status quo

Decoys

The desirability of good options can be emphasized with the use of less desirable "decoy" options

Loss aversion

People have a stronger aversion to losses than attraction to gains

Anchoring

People tend to rely on initial information



Social influences

Social norms

People want to fit in with what 'most people do' and what 'should be done'

Observability

People behave prosocially when they think others know what they are doing

Leaders

Whom we receive information from can be as powerful as the information itself

Public commitments

People want to maintain prestige and reputation



Management is fundamentally about regulating **human behavior**. However, fisheries co-management can often fail from limited understanding of how people make decisions and follow rules. Leveraging insights into human behavior can therefore make co-management more effective.

For example, **cognitive biases** make people behave in seemingly strange but predictable ways. These include the **loss aversion bias**, where motivations to use resources sustainably can be higher when issues are framed to highlight the potential losses from not doing so, rather than gains. Likewise, people tend to rely on the first information they hear (**anchoring bias**), which can be used to set targets for species recovery early on.

Social influence is the idea that people are influenced by their desire for prestige, reputation, conformity, and reciprocity. For example, when poaching is a problem, **social norms** can be used to frame that most people follow the rules, highlighting poachers as norm-breakers. Likewise, **public commitments** to support co-management and

follow rules can be important because of people's desire to maintain prestige and reputation.

Importantly, while interest in leveraging human behavior is expanding, it has had limited engagement with questions of **equity and power**. Careful consideration is required of the potential **misapplication** of leveraging human behavior for fisheries co-management.

Reflection questions:

- What cognitive biases could be used to improve co-management?
- How could we leverage social influence to improve co-management?
- Is influencing people to follow these rules the right thing to do?

Further reading, see references:

Abrahamse and Steg 2013.
Cinner 2018.
Crosman et al. 2022.



Co-management adoption and spread

Number of communities involved in co-management

Enabling conditions:

- ✓ Political empowerment
- ✓ Supportive institutions
- ✓ Proximity to other adopters
- ✓ Access to decision making processes
- ✓ Observable and relevant benefits
- ✓ Environmental conditions
- ✓ National policies, compatibility with needs
- ✓ Access to support, access to social capital

Slow – Saturation of co-management limits spread

Fast – more communities spread co-management to potential adopters

Slow – low density of co-management limits spread

Time

The adoption and spread of fisheries co-management programs is rarely random.

Typically, co-management adoption follows a **slow-fast-slow dynamic**. In the early stages adoption is slow, since not many communities are aware of the program. But as more communities join word spreads and the rate of adoption increases. Later, once most communities are aware of the program or already involved, adoption of the program reaches saturation point and slows back down. Characteristics of the co-management program, communities, and context will influence the extent and rate of adoption and spread. For example, co-management programs are more likely to spread when engagement in the program offers clear and diverse benefits, there is available support, and it is embedded within local institutions.

Co-management is also not a fixed program, but rather is more about the behavior changes that reflect collective action principles or local visions of what sustainability should look like.

Lastly, expansion of co-management doesn't imply expansion of positive impacts – whether a program endures will depend on the realized benefits of engagement and how the program is governed. For lasting change, co-management programs need to be supported by and embedded within the larger governance system.

Reflection questions:

- How fast is our co-management program expanding and at what point along the expansion curve is it?
- How is the adoption and spread of the program supported?
- What capacity do partners have to support more adopters?

Further reading, see references:

Mills et al. 2019.

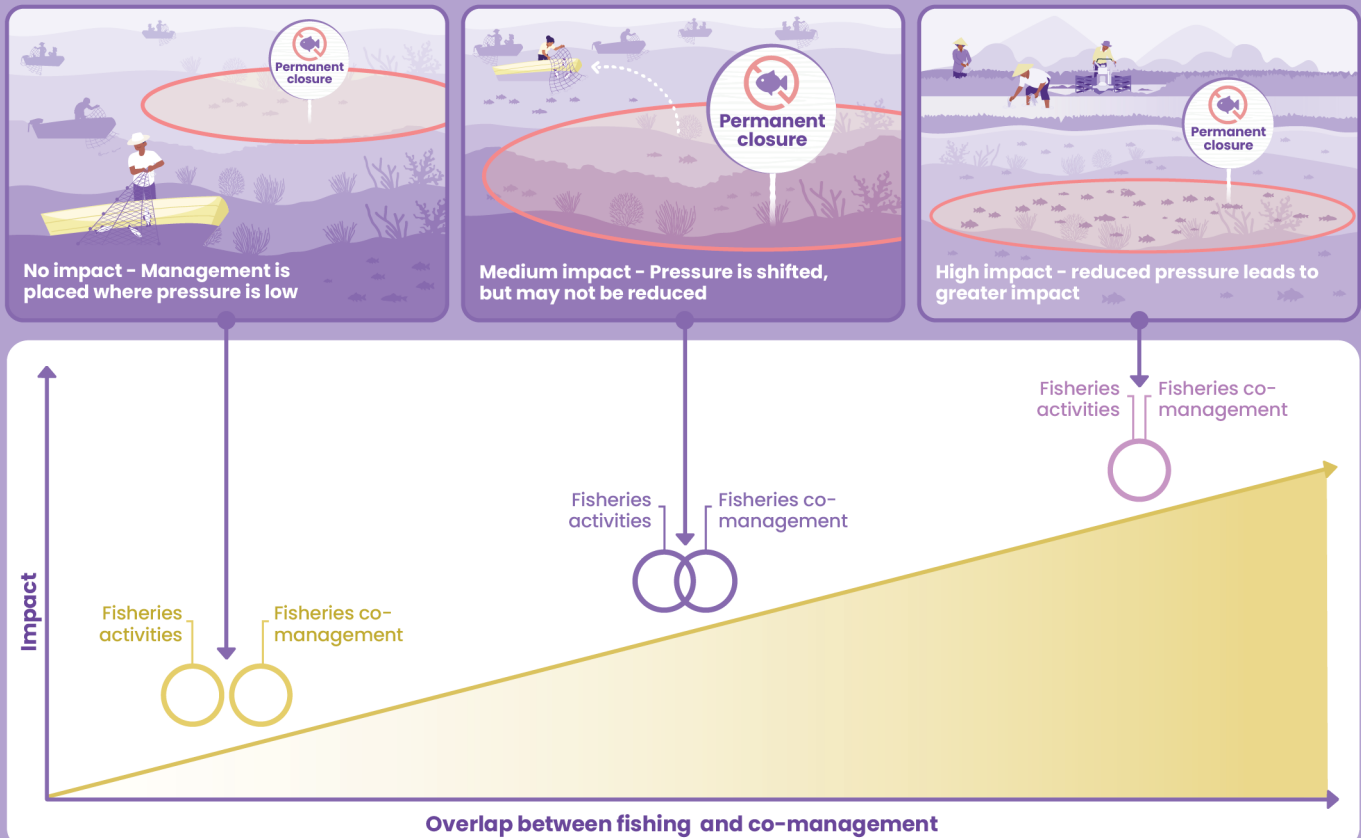
Smallhorn-West et al. 2020.

Steenbergen et al. 2021.

Managing for Impact



Impact



Impact is the difference co-management makes - be it social (e.g., gender equality), economic (e.g., income), or environmental (e.g., biodiversity).

Co-management impact only comes from changes in human actions, such as fishing. Therefore, the scale of impact relates directly to the scale for which fishing is changed or reduced.

Understanding impact means being able to compare the existing state of the system to what is called the **counterfactual state - what would have occurred if management had never been implemented.**

For example, fisheries closures are often implemented in areas that already have low fishing pressure, since this is less likely to upset people than placing them over the best fishing grounds. But fisheries closures with low overlap with fishing will also have low impact, since until fishing changes, no impact has been achieved. Unfortunately, this practice is very common and results in many co-management programs having low impact. A classic example is declaring massive marine protected areas in

unfished offshore waters. It is also important to consider that co-management might not actually change overall fishing levels, but simply shift them from one place to another. If this happens then impact might also be low even if fish stocks begin to recover inside fisheries closures.

This information should not imply that we should aim for maximum displacement of fishers, but rather that we need to carefully and honestly consider the differences co-management is likely to make.

Reflection questions:

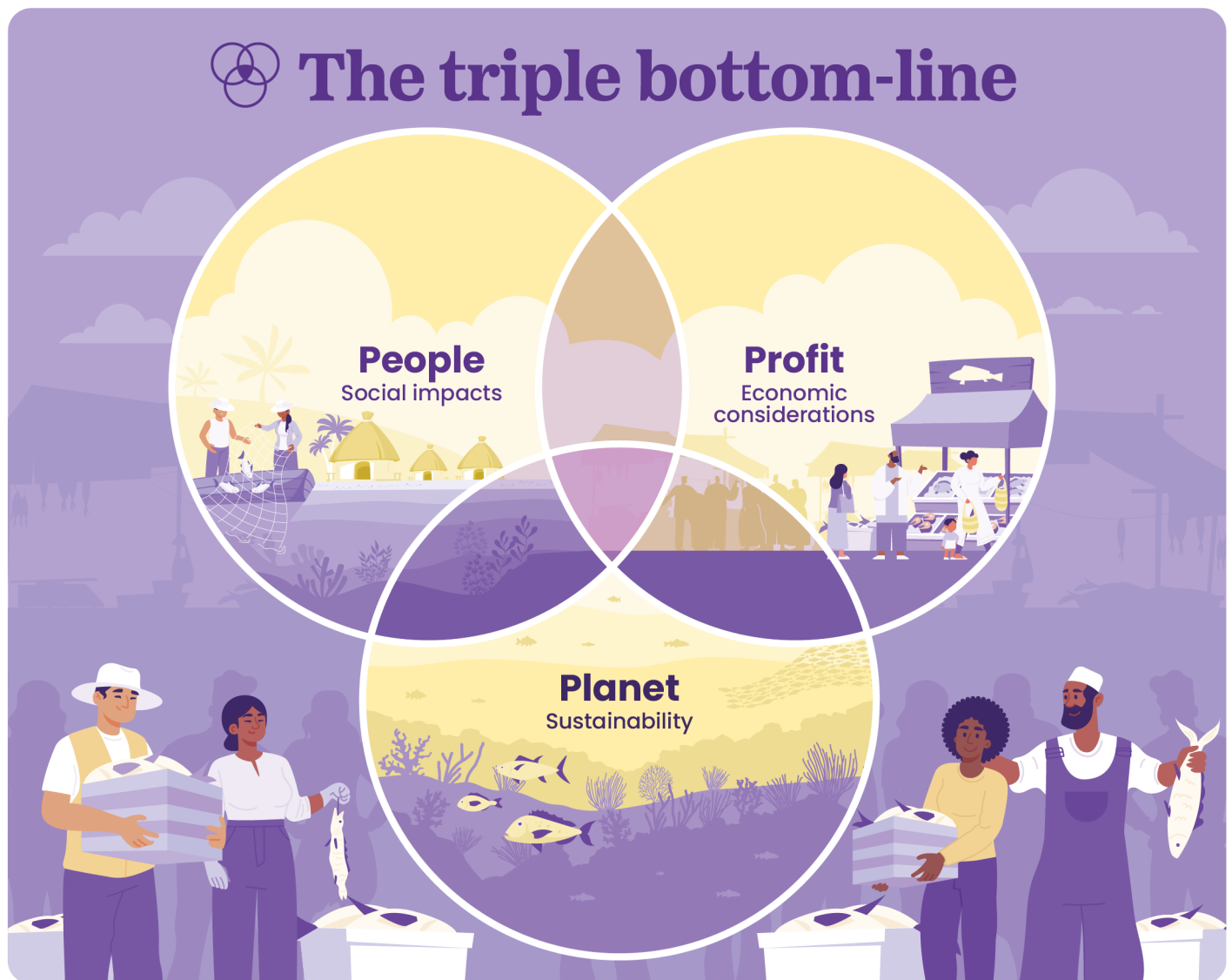
- Does co-management overlap with fishing in space and time?
- Does co-management overlap with other issues it is meant to resolve?
- If not, why?

Further reading, see references:

Pressey et al. 2017.

Pressey et al. 2021.

Smallhorn-West and Pressey 2022.



Successful co-management requires positive impacts across multiple dimensions.

The '**triple bottom-line**' is a business concept based on the need to comprehensively measure impact and success beyond profits alone (the historical 'bottom-line'). It acknowledges that successful strategies are those that are strong across **three components**: the **planet** (sustainability), **people** (social impacts) and **profit** (economic considerations).

For fisheries co-management this involves securing the **status of the resource**, the **rights of the people** involved in the sector, and the **financial structure** and stability of the system. Importantly, it says that a strategy is not successful if one of these factors is neglected. In fact, neglecting one dimension can exacerbate issues in another area.

For example, investments that improve market access without also ensuring resource sustainability can lead to

overfishing. Likewise, prioritizing sustainability without also considering well-being can lead to greater hunger and poverty. Lastly, improving social equity without also ensuring the economic 'bottom-line' can result in little economic incentive for people to participate in a fishery, even if it is viewed as fair.

Reflection questions:

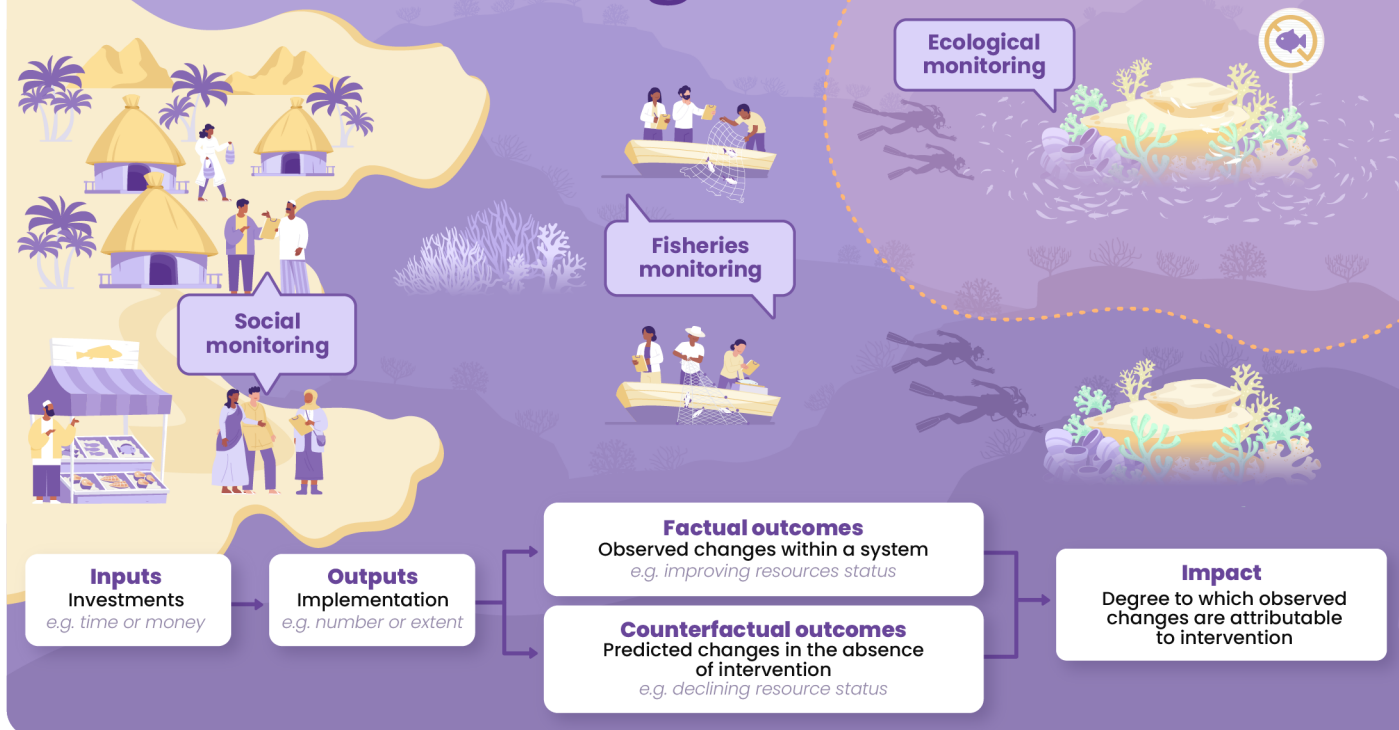
- What are the ecological, social, and economic impacts we are hoping to achieve?
- Are benefits falling disproportionately on one of these dimensions?
- Are costs falling disproportionately on one of these dimensions?

Further reading, see references:

Anderson et al. 2015.
Halpern et al. 2013.
Peckham et al. 2020.



Monitoring and evaluation



Monitoring and evaluation is the process of documenting changes and understanding how much co-management is responsible for observed changes. Without any monitoring and evaluation protocol in place, we can't say whether co-management is achieving its objectives. Ideally monitoring and evaluation should incorporate ecological, social, and economic indicators and be used to assess both the process of co-management, as well as its impacts.

Impact evaluation is the process of using monitoring and evaluation to understand how much difference a program has made, or could make, to desired objectives. This requires what is called **counterfactual framing**, which asks: **what would have happened in the absence of co-management?**

For example, this could mean measuring changes in what people are catching, or species diversity inside a fisheries closure, so long as you compare this to estimates if the fisheries closure had never been established.

Control groups can be very useful to estimating counterfactuals. For example, if a fisheries closure is on a healthy coral reef, then control groups should also be on healthy coral reefs. Using an unhealthy reef as a control group could exaggerate success or mask failures. Likewise, comparing income levels between villages with and without co-management might not be useful if one village is already

more wealthy than the other.

Importantly, monitoring changes in **inputs**, **outputs**, or **outcomes**, does not mean monitoring changes in impact. **Inputs** are things like the costs (e.g., time, money, personnel) associated with the co-management project. **Outputs** are things like the number or area of the co-management project (e.g., # fisheries closures, km² fisheries closures). **Outcomes** are the changes observed within the system (e.g., changes in species diversity through time). While the assumption is that these metrics correlate with impact, it is often incorrect.

Reflection questions:

- How much difference has co-management made compared to if it had not occurred?
- What is the counterfactual situation?
- Is our program measuring impact, or are we measuring inputs, outputs, or outcomes?

Further reading, see references:

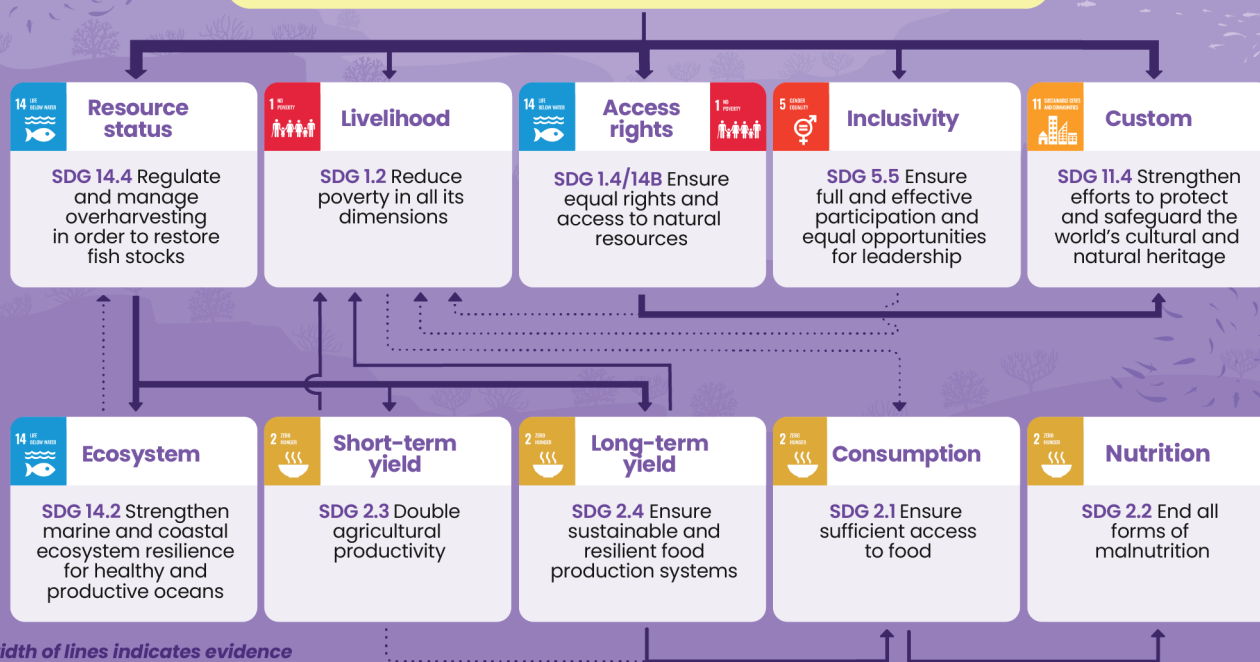
Ferraro 2009.
Gurney and Darling 2017.
Pressey et al. 2015.
Smallhorn-West et al. 2019.



Connecting implementation to impact



The impact of fisheries co-management on...



Fisheries co-management can help achieve many UN Sustainable Development Goals (SDGs), including SDG1 No Poverty, SDG2 Zero Hunger, SDG5 Gender Equality, SDG11 Sustainable Communities, and SDG14 Life Below Water. But **not all co-management strategies will achieve these objectives equally.**

Some **objectives** are **dependent on others being reached first**. For instance, co-management won't improve livelihoods or health unless first the status of the resource changes (e.g., how much fish), which must then lead to improved catch, followed by changes in either economic benefits, fish consumption, or both.

To understand the effectiveness of co-management, we need **evidence** for the various **pathways** that must occur for results to be achieved. This **Theory of Change** maps the **strength of evidence** for fisheries co-management within these five SDGs, with the width of the lines indicating the evidence for positive impacts. For example, there is strong evidence linking fisheries co-management to changes in

resource status and supporting access rights for fishing communities but there is less evidence linking fisheries co-management to other SDG targets such as changes in food consumption and nutrition.

Overall, it is important that both communities and external actors understand there is not a single solution for all problems and that '**leaps of logic**' can lead to poor outcomes, inefficiencies, and unrealistic expectations.

Reflection questions:

- Do we understand the pathways to the impacts we want to achieve?
- Are there any other factors along the way we might be missing?
- Are our expectations realistic?

Further reading, see references:

Smallhorn-West et al. 2022.

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