PIONEERING SDG 14-LIFE BELOW WATER

Holistic Solution for Ocean Sustainability

Sahnn
Presented by JWT

Contents

Restoring Blue Frontiers: PBRC Innovations for Ocean Conservation in Indonesia

Introduction

The health of the world's oceans is at a turning point. Rising temperatures, overfishing, plastic waste, acidification, and habitat loss are pushing marine ecosystems toward collapse. Among the hardest-hit regions is Southeast Asia, and at its heart lies Indonesia, a country made up of more than 17,000 islands, where the ocean is not only a vital part of its economy but also its culture, food systems, and identity.

Sustainable Development **Goal 14 (SDG 14) — *Life Below Water*** was established to "conserve and sustainably use the oceans, seas, and marine resources

for sustainable development." For Indonesia, achieving SDG 14 is not just a global responsibility but a national necessity. As one of the most marine-rich nations in the world, Indonesia's future is tied directly to the health of its seas.

However, the challenges are complex. Policies alone cannot fix marine degradation. Nor can isolated projects or short-term funding be. What is needed is a science-driven, deeply integrated, and scalable system that can align with national priorities, support local communities, and guide sustainable investments over time.

That is where PBRC comes in.

The PBRC (Planetary Blue Regeneration Code) is not just a tool. It is a comprehensive platform built on years of scientific research, global environmental

benchmarks, and deep regional understanding. It was designed to serve as a bridge between policy and practice, science and society, business and biodiversity.

This book introduces the PBRC in the context of Indonesia's marine challenges and opportunities. It serves three main purposes:

1. To showcase the urgency and scale of Indonesia's ocean conservation needs

2. To present PBRC as a system that translates global SDG goals into actionable, measurable steps at the national and local level.

3. To offer policymakers, researchers, and professionals a clear view of how PBRC can be adopted, adapted, and scaled within Indonesia.

The content of this technical setbook is based on real scientific models, sustainability metrics, national marine strategies, and a deep dive into Indonesia's socio-ecological dynamics. It is written in a way that is professional yet accessible, factual yet compelling, so that anyone with an interest in ocean governance can engage with the material.

Executive Summary

Indonesia's marine territory is among the most biologically rich on Earth. It is home to more coral reef species than the Great Barrier Reef, and its fishing grounds support millions of livelihoods. But this wealth is under growing threat. Illegal fishing, coral

bleaching, coastal development, oil spills, and plastic pollution are placing enormous pressure on Indonesia's marine environment.

At the same time, global climate change is altering currents, rising sea levels, and threatening biodiversity at a scale we are only beginning to understand. Without urgent and effective action, these pressures will undermine food security, economic growth, and the survival of coastal communities.

This book introduces the **PBRC**, a multi-dimensional system created to support Sustainable Development Goal 14 through a structured and science-led approach.

What is PBRC?

The PBRC (**Planetary Blue Regeneration Code**) is a methodology and implementation framework that

supports ocean regeneration, protection, and sustainable use. It is grounded in five pillars:

- Scientific data and evidence
- Policy alignment
- Local community inclusion
- Scalable funding models
- Continuous monitoring and feedback

PBRC works by assigning SDG “code points” to marine conservation projects based on their alignment with specific SDG 14 targets. It helps governments, private sector players, and NGOs measure impact, identify priority zones, and make funding decisions based on real data. This allows Indonesia to move from fragmented, reactive interventions to a unified, transparent, and outcome-driven national marine strategy.

Why PBRC, Why Now?

Indonesia has already shown leadership in the marine conservation space. The national ban on trawling, the expansion of marine protected areas, and the growing investment in blue economy sectors are all promising steps. But these efforts remain scattered, underfunded, and hard to track.

PBRC helps to solve that problem. It does not replace existing marine strategies; it strengthens them. It provides the tools, indicators, and strategic logic needed to scale these efforts in a transparent and results-oriented way.

For example, PBRC allows the government to:

- Map SDG 14 progress geographically and demographically

- Link SDG action to job creation, biodiversity protection, and climate adaptation
- Attract international blue finance with verified data
- Support community-based marine programs with direct SDG alignment
- Improve long-term sustainability planning in the fishing and coastal tourism sectors.

This is especially important for island nations like Indonesia, where marine policy must serve both environmental and economic needs.

Who Should Use PBRC?

This setbook is written for professionals, policymakers, researchers, and project developers working in ocean governance, climate adaptation, coastal resilience, and blue finance. Whether you are

designing a marine policy, launching a coastal conservation program, or trying to align your private sector project with SDG goals, **PBRC** gives you the foundation to do it right.

It is not a one-size-fits-all solution. PBRC is designed to be locally adaptive, technically flexible, and institutionally neutral. That means it can be used by ministries, research institutes, NGOs, investors, and even schools working on marine education.

What's Inside This Book?

- An overview of SDG 14 and how it applies to Indonesia
- A breakdown of Indonesia's marine challenges across sectors
- A deep dive into the PBRC system: logic, tools, and real-world application

- Examples of how PBRC can support marine policy, innovation, and investment
- A roadmap for integrating PBRC into Indonesia's national ocean strategy
- Calls to action for different stakeholder groups

In short, this book is **a blueprint for applying PBRC in Indonesia, not as an idea, but as a tool for real action.**

Closing Words

Ocean conservation is not just about saving fish or coral reefs. It is about protecting the systems that keep our societies alive. For Indonesia, this means securing the future of its islands, communities, and children.

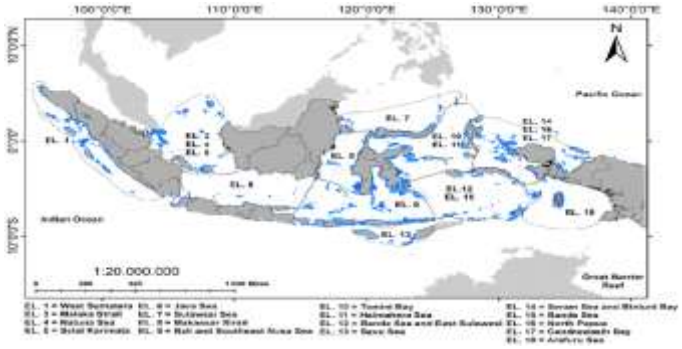
PBRC was built to support that mission with clarity, with evidence, and with a long-term vision. This book is the first step in putting that mission into motion.

Chapter 1: Indonesia's Marine Challenges

Indonesia's oceans are rich, vast, and diverse. They are home to some of the world's most important marine ecosystems, coral reefs, mangrove forests, and seagrass beds that support millions of lives. But these ecosystems are under serious threat. Climate change, unsustainable fishing, plastic pollution, coastal development, and ocean acidification are placing immense pressure on marine life and the communities that depend on it.

In this chapter, we look closely at the key challenges facing Indonesia's marine environment. These are not distant, future risks; they are happening now, backed by data and visible across coastal regions.

1. Coral Reef Loss.



Indonesia is part of the Coral Triangle, known as the ***"Amazon of the Seas,"*** holding over 500 species of reef-building corals. Coral reefs here support fish stocks, protect coastlines, and attract tourism. However, these reefs are disappearing fast.

According to the Ministry of Marine Affairs and Fisheries (2021), only about 6.5% of Indonesia's coral reefs are in "very good" condition. Over 30% are in

poor or damaged condition due to bleaching, dynamite fishing, coastal runoff, and sedimentation.

Major bleaching events were recorded during 1998, 2010, and 2016, tied to rising sea temperatures linked with El Niño and long-term climate change.

Case Example: Raja Ampat

Once considered one of the most pristine marine environments on Earth, Raja Ampat has seen increased coral stress due to warmer waters and tourism expansion. Even small increases in **temperature of 1–2°C** can cause widespread bleaching and disrupt spawning cycles.

Why it matters: Coral reefs serve as breeding grounds for over 25% of marine species. Their decline affects biodiversity, tourism income, and local food security.

2. Plastic and Marine Debris

Indonesia is the second-largest contributor to ocean plastic pollution, after China. Each year, the country produces around 6.8 million tonnes of plastic waste, and an estimated 620,000 tonnes of it end up in the ocean (World Bank, 2021).

The sources of marine debris are both land-based and ocean-based:

- Urban runoff and poor waste management
- River systems carrying trash to coastal areas
- Fishing gear, nets, and packaging waste are discarded at sea

Major Impact Zones:

Jakarta Bay, Bali beaches, and Makassar Strait are heavily polluted. Satellite and drone surveys show

thick layers of floating debris near river mouths and harbors. Plastic waste affects marine species through ingestion and entanglement. Microplastics are now found in fish tissues and even sea salt harvested from Indonesia's coasts.

Why it matters: Pollution harms marine life, damages fisheries, threatens tourism, and carries health risks to humans through the food chain.

3. Ocean Acidification

Ocean acidification occurs when CO_2 from the atmosphere dissolves into seawater, lowering its pH. This affects marine organisms that rely on calcium carbonate to build shells and skeletons, such as corals, mollusks, and some plankton.

Studies show that pH levels in Indonesia's coastal waters have dropped from around 8.2 to 8.0 over the

last 30 years. While this may seem minor, even slight changes in pH can disrupt marine ecosystems.

Key Vulnerable Areas:

Coastal zones near Java, Sumatra, and Bali show signs of acidification due to high carbon emissions and land-based pollution.

- Early Indicators:
- Slower coral growth
- Thinner shells in oysters and mussels
- Disrupted plankton blooms, affecting fish food chains.

Acidification **also reduces coral reefs'** ability to recover from bleaching or storm damage, weakening natural coastal protection.

Why it matters: **Acidification lowers marine productivity**, reduces seafood supply, and weakens reef resilience in the face of climate change.

4. Overfishing and Illegal Fishing

Indonesia's marine capture fisheries are among the largest in the world. The sector supports **over 12 million people** directly or indirectly. However, overfishing and illegal, unreported, and unregulated (IUU) fishing have led to declining stocks in many regions.

The Indonesian government has estimated that over 50% of fisheries are either fully exploited or overexploited. Fish sizes are shrinking, and catch-per-unit-effort (CPUE) continues to drop.

IUU Fishing Hotspots:

- Arafura Sea
- North Natuna Sea
- Maluku waters

Despite improved surveillance, many foreign and local vessels continue to fish without permits, use banned gear, or harvest protected species.

Why it matters: Unsustainable fishing depletes ecosystems, reduces long-term income for fishers, and makes marine management harder.

5. Coastal Habitat Destruction

Indonesia has the largest area of mangrove forests in the world, covering over 3 million hectares.

Mangroves protect coastlines from erosion, store carbon, and serve as nurseries for fish and crustaceans.

However, over 40% of mangroves have been lost due to:

- Shrimp farming
- Urban development
- Logging for charcoal

In cities like Jakarta, Semarang, and Surabaya, coastal reclamation projects have cleared large swaths of mangrove and seagrass habitats. These losses contribute to:

- Increased coastal flooding
- Loss of biodiversity
- Higher carbon emissions from degraded soils

Why it matters: Without natural buffers like mangroves and seagrass beds, coastlines become vulnerable to storms, flooding, and sea-level rise.

6. Climate Change and Rising Sea Levels

Indonesia is one of the most climate-vulnerable countries in the world. Its low-lying islands and coastlines face direct threats from rising seas and more frequent extreme weather events.

Sea levels in Indonesia have risen by an average of 6–8 mm per year in recent decades, higher than the global average. Cities like Jakarta are sinking faster than the ocean is rising due to groundwater extraction and land subsidence.

The combination of rising seas, storm surges, and coastal erosion already threatens over 23 million people living in coastal zones.

Why it matters: Without urgent adaptation and mitigation, climate change will reshape coastlines, displace communities, and increase economic losses.

Conclusion: A Complex and Urgent Challenge

Indonesia's marine challenges are deeply connected. Coral reef loss makes coasts more vulnerable to storms. Plastic pollution worsens the stress on fish stocks. Acidification weakens coral recovery. Overfishing and habitat loss threaten long-term food security. Climate change intensifies them all.

What makes these issues difficult is not just their scale, but their interaction. Addressing one without addressing the others is like fixing a leak in one part of a boat while the other side is sinking.

This is why a systems-based approach like **PBRC is urgently needed**. Policymakers, researchers, and

funders must think beyond isolated projects. What's needed is a national strategy that can link science, local action, investment, and policy in one unified framework. In the next chapter, we will explore how PBRC works and how it turns these complex problems into clear pathways for action, monitoring, and long-term change.

Chapter 2: Global Ocean Threats

A Global Lens on Shared Challenges

The problems facing Indonesia's oceans are not isolated. Across the world, countries are struggling with marine degradation, disappearing fish stocks, dying reefs, and rising sea levels. While the impacts may vary by region, the causes often overlap. This chapter places Indonesia's ocean challenges in a global context. It examines three key global threats: climate change, overfishing, and the wider trends shaping the future of marine conservation.

Understanding the global picture helps decision-makers see that ocean recovery requires both national leadership and international cooperation.

1. Climate Change and Its Impact on Oceans Worldwide

Climate change is one of the most powerful forces reshaping Earth's oceans. It is no longer a future threat; it is already altering ***ocean temperature, chemistry, and biodiversity in real time***.

- **Warming Oceans.**

The ocean absorbs **more than 90% of the excess heat trapped by greenhouse gases**. Since the 1970s, average sea surface temperatures have risen by 0.13°C per decade. Warmer waters cause coral bleaching, change fish migration patterns, and increase the intensity of tropical storms.

- **Global Trends:**

The Great Barrier Reef in **Australia has lost more than 50% of its coral** cover since 1995 due to repeated bleaching.

In the Arctic, shrinking sea ice is opening new shipping routes but endangering entire marine ecosystems.

Across East Africa, warming waters are affecting tuna availability, impacting economies that rely on fishing.

- **Rising Sea Levels.**

Global sea levels have risen by **about 21–24 cm** since 1880, with the rate of rise accelerating. This threatens low-lying island nations like the Maldives and coastal megacities like New York, Manila, and Jakarta. Erosion, saltwater intrusion, and flooding are becoming more common.

- **Ocean Acidification**

When the ocean absorbs carbon dioxide, it becomes more acidic. The global average surface pH has ***dropped from 8.2 to 8.1***, a **30% increase in acidity**. This impacts species that build shells or coral skeletons, disrupting food chains.

Global Impact Examples:

- In North America's Pacific Northwest, oyster hatcheries have seen mass die-offs due to acidified water.
- In the Mediterranean, acidification is slowing the growth of red coral, a key marine species.

2. Overfishing and Depletion of Marine Stocks

Overfishing is one of the most widespread human impacts on the ocean. According to the Food and Agriculture Organization (FAO, 2022), more than 35% of global fish stocks are overexploited, and nearly 60% are fully exploited, leaving little room for recovery.

Why It Happens:

- Growing demand for seafood
- Subsidized industrial fleets
- Weak enforcement of fishing laws
- Illegal, unreported, and unregulated (IUU) fishing
- Use of destructive gear (e.g., bottom trawls, drift nets)

Global Hotspots:

West Africa's coast has seen foreign fleets deplete local stocks, forcing artisanal fishers to go farther offshore.

The South China Sea is heavily overfished, with maritime disputes making regulation difficult.

The North Atlantic suffered a cod fishery collapse in the 1990s, which has never fully recovered.

In some regions, fish populations have declined by over 70% in just a few decades.

Bycatch and Waste.

Overfishing is often accompanied by bycatch, the unintended capture of non-target species such as dolphins, turtles, and juvenile fish. Millions of tons of bycatch are discarded each year, putting extra pressure on marine biodiversity.

3. International Comparisons: What the Data Shows

To put Indonesia's marine situation into perspective, it helps to compare key indicators with other coastal nations. While Indonesia has unique strengths, it also faces some of the highest combined pressures on its marine systems.

Country	**Marine Area (EEZ)**	**% Overfished Stocks**	**Plastic Leakage (tonnes/year)**	**Coral Reef Health**
Indonesia	6 million km²	50%	-620,000	6% in very

				good state
Philippines	2.2 million km²	50–60%	-500,000	10% in good condition
Australia	8.5 million km²	30%	-80,000	25% in good condition
Brazil	3.5 million km²	40%	-200,000	Reefs highly degraded

China	9.3 million km²	60–70%	1 million	Limited coverage

Indonesia's large marine area gives it high potential, but also places greater demands on monitoring, enforcement, and restoration efforts.

4. Shared Solutions, Global Lessons

While marine problems differ by country, many solutions can be shared. Countries that have made progress typically combine science, strong laws, local engagement, and investment.

Examples to Learn From:

- **Australia's Great Barrier Reef Marine Park**

Uses zoning, strict tourism limits, and real-time reef monitoring. The government invested over AUD 1 billion in reef resilience and adaptation programs.

- **Norway's Fisheries Management**

Combines quotas, satellite monitoring, and strong penalties. Its cod and herring stocks have recovered through science-based limits.

- **Costa Rica's Ocean Policy**

Integrated marine spatial planning, mangrove conservation, and payments for ecosystem services. It also uses citizen science to track changes.

- **Palau's Marine Sanctuary**

Banned commercial fishing in 80% of its waters. Relies on eco-tourism and strong local ownership of marine rules.

These models show that progress is possible when backed by leadership, funding, and inclusive planning.

5. Indonesia's Role in the Global Marine Agenda

As the largest archipelago nation on Earth, Indonesia plays a critical role in the global marine future. It hosts a significant portion of the Coral Triangle and has access to critical fisheries that serve global food markets.

Indonesia has already:

- Expanded marine protected areas
- Banned destructive fishing gear
- Reduced fuel subsidies for industrial fishing
- Launched plastic waste reduction campaigns.

- But the scale of the threats requires Indonesia to go further. Tools like the Planetary Blue Regeneration Code (PBRC) can help Indonesia align its national efforts with international benchmarks while adapting solutions to local realities.

Conclusion: The Ocean Connects Us All.

No nation can protect the ocean alone. The seas do not recognize borders, and the impacts of one country's actions are often felt in another's waters. A fish caught off the coast of Sulawesi may have hatched in the Philippines. Plastic dumped in one river may end up on a beach thousands of kilometers away.

This is why ocean governance must combine local action with global strategy. Countries need to share

data, align rules, and invest together in long-term marine protection.

In the next chapter, we explore how the PBRC system was built to support this kind of integrated thinking using data, local context, and global goals to make SDG 14 not just a dream, but a working plan.

Chapter 3: PBRC Patent Explained

Turning Ocean Goals into Measurable Action

The global push for ocean conservation has produced many plans, policies, and targets. But despite international agreements and national strategies, progress remains slow. Too often, the challenge is not a lack of intention, but a lack of tools and systems that can translate environmental goals into measurable, fundable, and trackable action.

The Planetary Blue Regeneration Code (PBRC) was created to fill this gap.

This chapter breaks down the PBRC system in simple terms. It explains how it works, what it solves, and why it matters, especially for countries like Indonesia,

where ocean health, coastal livelihoods, and national development are closely connected.

1. What is PBRC?

The PBRC **(Planetary Blue Regeneration Code)** is a patented framework that links real-world marine actions to specific Sustainable Development Goal (SDG) targets, **especially SDG 14 (Life Below Water).** It acts as both a measurement tool and a decision-making guide for policymakers, researchers, project developers, and investors.

At its core, PBRC is built on one key idea:

Marine conservation projects must be tracked and valued in the same structured way we track economic investments.

PBRC assigns point values (called "SDG Code Points") to different types of actions based on how much they contribute to ocean protection, restoration, and sustainable use. These points are verified through data, geolocation, impact metrics, and policy alignment.

In short**, PBRC is a digital architecture for measuring and managing ocean regeneration.**

2. Why PBRC Was Created: Solving Key Problems.

Before diving into the technical structure, it helps to understand the problems PBRC is designed to solve.

- **Problem 1: Fragmented Marine Projects.**

Across Indonesia and many other countries, marine programs are often designed in isolation. One community plants mangrove. Another builds a fish

hatchery. A third starts a plastic waste campaign.
These efforts may be valuable, but they often lack:

- Standard metrics
- National-level tracking
- Long-term funding links
- SDG alignment.
  PBRC solves this by **bringing all efforts into a single system** that tracks contributions and outcomes under one language.

- **Problem 2: Weak Data for Policy and Investment**

Many marine projects are underfunded because they can't show clear, verified results. Donors and investors

hesitate to support them. Governments struggle to report progress to international bodies.

PBRC solves this by using **a scoring system based on evidence**, allowing actions to be documented, verified, and compared across sites and time.

- **Problem 3: Lack of Incentives for Local Action**

Communities are often asked to protect the ocean without support or incentives. This leads to fatigue and low participation.

PBRC solves this by **helping governments and funders reward communities** with recognition, certification, or micro-payments for verified actions.

3. How PBRC Works: Step by Step

PBRC functions through a structured, layered system similar to how carbon credit frameworks work for climate action. Here's how it operates:

- **Step 1: Define the Marine Action**

The PBRC begins by identifying the type of activity being carried out. This could include:

- Coral reef restoration
- Plastic waste Mangrove planting
- collection
- Coastal clean-ups
- Sustainable aquaculture
- Community marine education
- Illegal fishing patrols

Each action is mapped to a specific SDG 14 sub-target (e.g., 14.1: pollution reduction, 14.2: ecosystem restoration, etc.).

Step 2: Assign SDG Code Points

- Each activity is assigned a point value based on:
- Environmental impact
- Geographic scale
- Community involvement
- Timeframe
- Use of scientific methods
- Measurability and documentation

For example:

A large-scale mangrove restoration project that restores 50 hectares and includes monitoring may earn 200 points.

A single-day beach clean-up with strong community participation but low ecological impact may earn 30 points.

The point scale is transparent and repeatable, which allows comparisons across regions and timelines.

Step 3: Verification and Monitoring

- To avoid greenwashing or exaggeration, PBRC includes a verification layer. This involves:
- Satellite mapping or drone imagery
- On-the-ground reports and GPS-tagged photos
- Before-and-after biodiversity assessments
- Local government and NGO confirmation

Verified actions are recorded in the PBRC system and stored in a digital log that can be accessed by funders, regulators, or community stakeholders.

4: Linking to Step Funding and Policy

Once activities are verified and scored, they can be:

- Used to show national SDG progress
- Submitted for inclusion in marine spatial plans
- Shared with donors, investors, or ESG funders
- Used to award community-based performance incentives

Over time, this builds a credit-based system where ocean-friendly actions become trackable "assets" — just like carbon credits, but focused on marine regeneration.

4. PBRC in Action: Sample Use Cases

Use Case 1: Community Mangrove Program in Sulawesi

A coastal village has been restoring mangroves for five years. With PBRC, the local project team:

- Registers each planting activity by GPS location
- Tracks survival rate and tree health
- Submits regular reports and drone images
- Earns SDG Code Points that are logged in the national PBRC database
- Qualifies for small government subsidies for verified ecosystem services

This allows the village to get recognized, earn support, and build data that can be used in broader blue economy plans.

Use Case 2: Marine Park in Eastern Indonesia

A marine protected area wants to improve monitoring and funding. PBRC is used to:

- Log all enforcement patrols and outcomes
- Track reef restoration efforts by NGOs
- Score community awareness programs
- Link verified actions to regional conservation strategies
- Report progress to international SDG platforms

The marine park then becomes eligible for global blue finance instruments, thanks to clear metrics.

5. How PBRC Supports SDG 14 Implementation

SDG 14 has ten sub-targets. PBRC covers each of them with corresponding action types and scoring logic:

SDG 14 Target PBRC Coverage

- 14.1 (Pollution) Plastic clean-ups, waste prevention campaigns
- 14.2 (Ecosystems)Coral and mangrove restoration, habitat protection
- 14.3 (Acidification)Monitoring networks, education, CO_2 capture pilots
- 14.4 (Overfishing)Sustainable fisheries, IUU patrols, quota compliance
- 14.5 (Protected areas) Zoning, enforcement, MPA effectiveness tools
- 14.6 (Subsidy reform) tracking of fishing subsidies

- 14.7 (Blue economy) Aquaculture, tourism, coastal enterprise mapping
- 14. a (Research) Data collection, citizen science projects
- 14.b (Artisanal fishers) Empowerment, catch logs, rights mapping
- 14.c (Law/Policy) Linking actions to UNCLOS compliance and marine laws

6. Why PBRC is a Strategic Fit for Indonesia

Indonesia has many marine programs. But what it lacks is a unified, science-driven system that helps link all actions together in a measurable, transparent way.

PBRC helps Indonesia:

- Avoid duplication of effort across ministries and NGOs
- Track national SDG 14 progress at the project level
- Align local community work with national marine goals
- Build a credible pipeline of ocean-positive projects for international finance
- Communicate marine success stories in a clear, structured format

It is not just a tool; it is a governance framework that supports long-term planning, coastal adaptation, and policy credibility.

Conclusion: A Digital Backbone for Ocean Regeneration

PBRC turns good intentions into measurable outcomes. giving every ocean-related action a clear score, a verification path, and a reporting channel helps governments, communities, and funders speak the same language.

Indonesia stands to benefit the most. With its massive coastline, rich biodiversity, and active civil society, it is perfectly placed to lead in SDG 14 delivery, but only if it has the right tools.

PBRC is that tool that we will explore on how Indonesia can integrate PBRC into national marine strategies and step by step, and unlock the full potential of its ocean future.

Chapter 4: Marine Tech Trends

Emerging Technologies and PBRC's Role

The ocean is vast, complex, and constantly changing. Monitoring it in real time has always been a challenge. But recent advances in technology, particularly artificial intelligence (AI), the Internet of Things (IoT), and satellite monitoring, are transforming how we understand and manage marine ecosystems.

This chapter explores how these technologies are shaping the future of ocean governance and how the PBRC system is designed to integrate with them. For Indonesia, adopting these tools can strengthen decision-making, reduce waste, improve enforcement, and unlock new funding.

1. Artificial Intelligence (AI)

AI uses algorithms to analyze large amounts of data and identify patterns. In marine conservation, it helps by:

- Detecting illegal fishing activity through vessel movement data
- Analyzing underwater drone footage for coral health
- Predicting coral bleaching events using ocean temperature trends
- Classifying species in real time with smart sensors.

Example:

Google's AI-based Global Fishing Watch platform uses vessel GPS data and satellite images to flag suspicious fishing behavior. This technology can help

countries like Indonesia **monitor remote areas** with limited staff.

How PBRC Fits In:

PBRC can plug into AI systems to automatically verify activity. For example, when AI confirms coral restoration through drone footage, PBRC can assign code points without needing manual review. This **reduces delays and adds consistency in project scoring.**

2. Internet of Things (IoT)

IoT refers to connected sensors and devices that collect and transmit data. In marine settings, IoT is used to:

- Measure water temperature, salinity, and acidity
- Track fish migration through tagged species

- Monitor wave patterns and sea-level changes
- Report illegal fishing via smart buoys or camera traps

Example:

In the Philippines, smart fishing vessels send real-time catch data to local governments. This helps **reduce overfishing and improves quota planning.**

How PBRC Fits In:

PBRC can receive direct input from IoT systems to validate on-site data — for example, if sensors confirm improved water quality in a mangrove restoration zone, the system can update points accordingly. This builds trust and reduces paperwork.

3. Satellite Tracking and Remote Sensing

Satellites offer a bird's-eye view of the ocean. Remote sensing uses satellites to monitor:

- Coastal erosion
- Coral reef bleaching
- Algal blooms
- Illegal trawling
- Ship traffic in protected areas

Example:

Indonesia's **own LAPAN satellites** are being used to monitor land use changes along coastlines, including mangrove deforestation.

How PBRC Fits In:

PBRC is designed to integrate with national and global satellite databases. For instance, if satellite imagery confirms that a coastal zone has gained 10 hectares of

vegetation cover, that change can be logged and scored automatically in the PBRC dashboard.

4. Blockchain and Data Transparency

Blockchain allows secure, transparent data sharing. It's being tested in traceable seafood supply chains, marine permits, and environmental credits.

How PBRC Fits In:

PBRC can use blockchain to log verified SDG Code Points. This ensures no tampering or duplication and helps maintain integrity for funders and governments. If Indonesia wants to attract blue bonds or ocean-positive investment, blockchain-backed data adds credibility.

5. Combining Tech into One System

What makes technology powerful is not each tool on its own, but how they work together. AI analyzes, IoT collects, satellites confirm, and PBRC brings it all into one measurable, policy-aligned framework.

For example:

- IoT buoys monitor coral reef health
- AI classifies footage
- Satellites verify changes
- PBRC scores and logs the project impact
- A funder uses PBRC data to support scale-up

Conclusion

Marine technology is changing fast. For Indonesia, the key is not just adopting high-tech tools, but making them useful and scalable. PBRC acts as the connector,

translating raw data into decisions, funding, and policy action.

By using PBRC alongside marine tech, Indonesia can lead a new model of ocean governance: science-based, data-driven, and community-supported.

Chapter 5: PBRC in Indonesia (Pilot Example)

The pilot began quietly in a small coastal village in South Sulawesi, where fishing is both a livelihood and

a tradition passed through generations. The team introduced PBRC through a simple community meeting. A few villagers were skeptical at first. They had seen many projects come and go, often with no lasting benefit. Others were curious, especially the younger residents who had access to mobile phones and were familiar with digital tools.

During the first week, the PBRC team focused on training. Rather than use technical jargon, they explained SDG 14 through real stories. Coral loss was explained by showing damaged reef photos taken near the village. Plastic pollution was discussed using actual waste collected along the shoreline that morning. These small actions helped connect global goals to the everyday life of the community.

Youth groups played a major role. Several volunteers to try the PBRC mobile logging system during a mangrove planting effort. Their task was to track the number of seedlings planted, log GPS locations, and upload photos before and after. The results were verified by a local teacher trained as a third-party validator. Within three days, the village saw its first 300 PBRC points recorded and published. That moment changed how the community saw the system.

Older fishers began logging their patrols using a simplified form of the PBRC tool. Their patrol logs helped show how much area they covered and how many illegal nets they removed. For many of them, this was the first time their efforts were recorded and recognized.

One of the key challenges during week two was power. Many villagers had smartphones but struggled with battery life. To solve this, the team installed a small solar charging hub near the village center. This small adjustment made a big difference and encouraged more participation.

The pilot site also hosted a learning day for officials from nearby districts. They observed how PBRC helped track coral reef health, measure community-led cleanups, and build a verifiable local marine record. Several asked for their own trials.

Perhaps the most powerful feedback came from a local elder named Bapak Rudi. After seeing the PBRC dashboard on a tablet screen, he said, “Now we can show what we do, not just tell stories.” That statement captured the deeper value of the system. PBRC was

not just a tool. It became a source of visibility and pride.

This pilot confirmed that even in resource-limited areas, PBRC could work as long as it respected local rhythms, involved youth, and adapted to daily life. The lessons learned here shaped the broader roadmap for national rollout.

Testing the System with a Real Community

- No tool is complete until it works on the ground. That's why the PBRC system includes pilot testing in real communities. These pilots help validate the scoring logic, build trust, and show how the system performs in real-world marine settings.
- This chapter outlines a realistic PBRC test site setup in Indonesia, including the site selection, community engagement, technology use, and expected results. The goal is to show how PBRC can support both national marine goals and local livelihoods.

1. Choosing the Pilot Site

The selected test site is a coastal village in North Sulawesi. This region has:

- A mix of coral reefs, mangroves, and seagrass
- Active community fishing and tourism
- Ongoing threats from erosion and plastic waste
- A local NGO presence with marine conservation experience

The site offers diverse conditions that are ideal for testing multiple SDG 14 targets and PBRC scoring mechanisms.

2. Engaging the Community

From the start, PBRC emphasizes inclusion. The pilot team meets with:

- Village leaders
- Fishermen’s groups
- Women-led eco-tourism cooperatives
- Youth environmental clubs

Together, they co-design the project plan. Everyone is briefed on what PBRC is, how it works, and how actions will be recorded and rewarded.

Workshops are held to:

- Identify local marine challenges
- Prioritize activities (e.g., coral repair, mangrove planting)
- Train youth to use GPS tagging and phone-based reporting
- Build trust around the verification process

3. Planned Pilot Activities

The following actions are selected for PBRC scoring:

Action	**Linked SDG Target**	**PBRC Feature**

Mangrove replanting (5 hectares)	14.2 (ecosystems)	Points based on area, survival rate
Weekly beach clean-up	14.1 (pollution)	Points based on the weight community
Coral garden restoration	14.2 (ecosystems)	Points from AI drone footage and diver logs
Plastic education program	14.b (fishers)	Points from attendance and activity reports

GPS-based catch tracking	14.4 (sustainable fishing)	Points are based on compliance and reduced bycatch.

Each activity is logged with photos, time stamps, and coordinates using a simple mobile app.

4. Use of Technology

The pilot includes basic but effective tech:

- Smartphones for citizen reporting
- Drones for coral monitoring
- Simple water sensors to test acidity and temperature
- GPS tags for tracking restoration plots

PBRC receives this data, verifies it with local partners, and assigns SDG Code Points automatically. A digital dashboard shows total community contributions and estimated SDG 14 progress.

5. Community Incentives

To encourage participation, the project offers:

- Public recognition for high-impact groups
- Small stipends or equipment (e.g., gloves, seedlings)
- A village-wide certificate for total PBRC points reached
- Possibility of scale-up funding based on verified results

The community is not paid per action; instead, PBRC values collective impact over time.

6. Expected Outcomes

After six months, the PBRC pilot is expected to:

- Verify restoration of at least 5 hectares of mangroves
- Remove over 2 tonnes of coastal plastic waste
- Increase awareness of SDG 14 in 100+ local residents
- Provide proof-of-concept for PBRC scoring in mixed-action projects
- Build local leadership in marine protection

The pilot will also help fine-tune the PBRC system:

- Adjusting point values where needed
- Testing offline data collection
- Improving user instructions and training materials

7. Scaling Lessons

Once the pilot succeeds, the approach can be replicated in:

- Other coastal provinces (e.g., Maluku, East Nusa Tenggara)
- Marine tourism hubs like Bali and Lombok
- Fishing zones needing SDG tracking for subsidy reform

The PBRC platform makes it easy to scale, as each community can be added with minimal tech and training.

Conclusion

- A strong system begins with a strong test. This pilot shows how PBRC can function in a real Indonesian coastal setting, balancing national targets with local priorities. With community trust, basic tech, and clear metrics, PBRC becomes more than a model. It becomes a movement.

Chapter 6: Policy Recommendations

Aligning PBRC with the National Strategy for Scalable Ocean Impact

Indonesia's marine conservation goals are ambitious, and they need to be. As a nation of islands, Indonesia's economic stability, food security, and resilience to climate change all depend on the health of its oceans.

The PBRC system offers a scalable and evidence-based way to track and accelerate progress toward Sustainable Development Goal 14 (Life Below Water). But for PBRC to work at scale, it must be integrated into real policy frameworks both at the local and national levels.

This chapter offers clear, practical policy recommendations for Indonesian decision-makers, backed by insights from field testing and international best practices.

To support national scale-up, **PBRC must fit smoothly** into existing Indonesian governance frameworks. This means aligning with ongoing policy cycles, reporting formats, and decentralized planning tools. One of the key vehicles for this integration is the RPJMN, the National Medium-Term Development Plan, which sets the country's five-year targets.

The Ministry of National Development Planning (Bappenas) already uses SDG indicators as part of RPJMN tracking. However, indicators for SDG 14 are often vague or underreported. PBRC can fill that gap. By offering a low-cost, field-level verification method,

it allows ministries to measure progress not just in terms of funding spent, but in results achieved on the ground.

PBRC could be referenced in key government documents such as:

- RAN SDGs – Indonesia's National Action Plan for SDGs
- RTRW (spatial plans) – especially in coastal provinces where marine zoning is active
- KLHS (Strategic Environmental Assessments) – to verify restoration or mitigation efforts
- DAK (Special Allocation Funds) – as a performance metric for marine-related disbursements

To operationalize these links, the PBRC roadmap can be broken down into phased national targets. Each

phase builds on the previous, ensuring technical readiness, policy buy-in, and community inclusion.

National PBRC Policy Roadmap

Phase	**Timeframe**	**Key Activities**
1. Pilot Completion	*Months 1–6*	:Validate PBRC in 3–5 provi refine scoring, and gather pol feedback.
2. Regional	*Months 7–18*	Embedding: Integrate into dis planning documents (RKPD) regional training sessions
3. Ministerial Adoption	*Months 18–30*	Include PBRC in the Bappen SDG toolkit, connect with DA and climate finance flows.

4. National Reporting	**Years 3–4**	Integration Link PBRC to the national SDG dashboard and include in the RPJMN impact review.
5. Institutionalization	**Years 4–5**	PBRC becomes a national tool budget lines, official mandates a legal basis.

- Each phase will require collaboration between ministries, universities, local leaders, and funders. Importantly, no single agency should "own" PBRC; its strength lies in shared use and community trust. By moving step by step, Indonesia can build a marine verification system that is not just functional, but also sustainable and fair.

1. Strengthen National Alignment with SDG 14 Targets

Current Gap:

While Indonesia has many marine laws and programs, they are not always clearly linked to the specific sub-targets of SDG 14. Reporting is often general, and progress tracking is inconsistent.

Recommendation:

Mandate that national ministries (e.g., Marine Affairs, Environment, Planning) formally align their programs with each of the 10 SDG 14 sub-targets. PBRC can serve as a reporting and validation tool, making this alignment measurable and transparent.

Action Point:

- Include PBRC within the national SDG monitoring system (e.g., Bappenas' reporting tools).
- Require PBRC-coded reporting for all government-funded marine projects.

2. Local Government Integration

Current Gap:

Local governments are responsible for coastal zoning and marine resource use, yet many lack the technical tools or data to guide sustainable decisions.

Recommendation:

Roll out PBRC at the district and provincial levels, especially in coastal and island areas. This gives local governments a low-cost way to track community

projects, enforce marine zoning, and report progress with evidence.

Action Point:

- Offer PBRC training to local officials and coastal village leaders.
- Integrate PBRC into local planning documents (e.g., RPJMD, RTRW).
- Link PBRC scores to eligibility for provincial-level funding or grants.

3. Marine Spatial Planning and Zoning Reform

Current Gap:

Indonesia’s marine spatial plans are strong in design but weak in enforcement. Zones may exist on paper but lack monitoring and data feedback loops.

Recommendation:

Use PBRC to monitor marine zones in real time. Activities such as reef restoration, enforcement patrols, or fishing compliance can be logged and verified through PBRC.

Action Point:

- Require PBRC verification in high-priority Marine Protected Areas (MPAs).
- Use PBRC data to update zoning maps based on real outcomes, not just assumptions.
- Involve community-based groups in PBRC-based monitoring.

4. Support for Community-Led Projects

Current Gap:

Communities often do the hard work of ocean protection, planting mangroves, patrolling fishing zones, or educating youth, yet receive little recognition or support.

Recommendation:

Make PBRC a formal pathway for communities to gain credit for their actions. Verified PBRC points can be linked to national incentive programs, NGO grants, or recognition systems.

Action Point:

- Create a “Blue Community” status awarded based on PBRC scores.
- Offer small financial or equipment support to verified high-impact villages.
- Include PBRC results in public marine dashboards to increase visibility.

5. Link to Blue Economy Investment and Financing

Current Gap:

Indonesia is exploring blue bonds, climate finance, and ESG investments, but lacks a standardized, scalable way to measure project impact.

Recommendation:

Adopt PBRC as the official impact tracking tool for blue finance programs. Verified PBRC data can be used to assure investors, reduce risk, and increase funding access.

Action Point:

- Include PBRC scoring in national investment guidelines for blue projects.
- Use PBRC to create a pipeline of fundable, pre-verified marine projects.

- Engage public banks and donor agencies to recognize PBRC metrics in proposals.

6. National PBRC Coordination Unit

Current Gap:

- Scaling PBRC requires coordination between ministries, local governments, NGOs, and communities. Without a central body, implementation will be slow and uneven.

Recommendation:

- Establish a national PBRC coordination unit, either within the Ministry of Marine Affairs or as a multi-agency task force.

Action Point:

- Task the unit with national rollout, training, data collection, and reporting.
- Build partnerships with universities and research centers to support verification.
- Develop a digital dashboard that tracks PBRC activity by region.

7. Integration with Education and Youth Programs

Current Gap:

- Youth engagement in marine conservation is growing, but often lacks structure or links to national targets.

Recommendation:

- Use PBRC as an education tool in schools, universities, and youth-led environmental programs.

Action Point:

- Develop a simplified PBRC learning module for schools in coastal areas.
- Offer points for student-led beach cleanups, reef education, or marine research.
- Partner with student environmental clubs to pilot PBRC projects and reporting.

8. Digital and Legal Infrastructure

Current Gap:

- Technology adoption in the marine sector is uneven, and many areas lack internet access or policy frameworks to support digital tools.

Recommendation:

- Invest in the digital backbone needed for PBRC: data systems, mobile access, legal

guidelines for verification, and privacy protections.

Action Point:

- Integrate PBRC into Indonesia's One Data policy.
- Create a legal framework for digital marine credits and verification.
- Expand mobile-based reporting apps for use in offline or remote areas.

PBRC Scale-Up Roadmap

Here's a simple, step-by-step roadmap to scale PBRC across Indonesia in three phases:

Phase	**Timeframe**	**Key Actions**
Pilot & Validation	Year 1	: Complete test sites, finalize

		scoring, and train key users
Government Adoption	Years 2–3	Integrate into policy tools, SDG reporting, and local government systems
National Scale-Up	Years 4–5	Roll out to all provinces, connect with finance, and adopt as the official marine SDG tracker.

Conclusion

- Indonesia has the opportunity to become a global leader in marine governance, not by creating more documents, but by building systems that turn policy into action. PBRC provides a ready-to-use structure for that.

With proper integration, PBRC can help:

- Track marine recovery in real time
- Support coastal communities
- Guide public and private investment
- Strengthen national and global credibility.

- The ocean's future depends on what we do now. By adopting PBRC as part of the national strategy, Indonesia can ensure that every effort

from a single mangrove to a national zoning plan counts toward a shared, measurable goal.

Chapter 7: Blue Economy Link

PBRC's Role in Building Jobs, Livelihoods, and Local Growth

Indonesia's blue economy holds vast untapped potential. With more **than 17,000 islands** and the second-longest coastline in the world, the country is well-positioned to lead in sustainable ocean-based industries. From fisheries and tourism to renewable

energy and seaweed farming, the ocean offers jobs, food, and income, but only if managed wisely.

The challenge is not just protecting the ocean. It's proving that a healthy ocean can fuel real economic growth, especially for communities that live closest to it.

This chapter explains how the PBRC system helps strengthen the blue economy. It shows how data, verification, and recognition of marine actions can support long-term income, unlock funding, and link conservation to jobs and enterprise.

One **promising example** of blue economy integration comes **from East Nusa Tenggara**, where seaweed farming has long been a source of local income. Traditionally, farmers sold raw seaweed with limited bargaining power. But after a PBRC-aligned project

began tracking cultivation areas, harvesting practices, and coastal management improvements, the co-op was able to document environmental benefits linked to their activities.

Through PBRC, the co-op logged **actions like reducing runoff**, protecting nursery zones, and managing plastic waste from farming materials. These verified records were later included in a funding proposal to a sustainable seafood initiative. The co-op secured small equipment upgrades and received national recognition. More importantly, it began commanding better prices by supplying to buyers who valued traceable, low-impact products.

Similar opportunities are emerging **in ecotourism**. In parts of Central Sulawesi, communities that monitor and protect reef sites now offer snorkeling trips guided

by trained locals. Visitors are shown not just coral, but also PBRC-verified data on how the reef is being restored. This gives tourists a sense of participation in conservation, while bringing new income to guides, boat operators, and homestay owners.

When marine actions are documented and certified through **a transparent system like PBRC,** they become part of a larger value chain. For instance:

- A coastal village that verifies plastic waste removal through PBRC may link with a recycling startup for regular collection and resale.
- A group of local fishers using sustainable methods can show PBRC records of catch sizes and areas avoided, which supports eco-labeling and better market access.

- A women's group managing mangrove nurseries can apply for government support using PBRC logs as proof of long-term impact.

Beyond direct economic value, PBRC also plays a role in job training. In Banyuwangi, a vocational school introduced PBRC into its environmental studies module. Students learned how to score marine activities, collect data, and use the app to verify their own small projects. A few of these students later joined local NGOs as paid assistants on larger coastal restoration efforts. This kind of hands-on exposure gives young people a meaningful path into green jobs.

As the blue economy grows, credibility will be essential. Buyers, investors, and government agencies all want proof, not just promises. PBRC provides that

proof in a way that is simple, local, and credible. It builds a shared language between communities doing the work and institutions funding or scaling it.

In the end, PBRC does not replace economic systems. It adds trust to them. It helps connect small-scale action to national strategy, and local knowledge to global opportunity.

1. What is the Blue Economy?

The blue economy refers to the sustainable use of ocean resources to drive economic growth, improve livelihoods, and protect marine ecosystems. It's not limited to one sector. It includes:

- Fisheries and aquaculture
- Marine tourism and transport
- Coastal renewable energy (e.g., tidal, wind)
- Seaweed and algae farming

- Marine biotechnology
- Waste management and ocean cleanup industries

For Indonesia, these sectors already contribute more than USD $280 billion annually, with room for growth if managed sustainably.

2. Why PBRC Matters to the Blue Economy

- Many blue economy projects struggle with two things:
- Lack of data to show real environmental and social benefits
- Limited investor confidence due to unclear reporting or greenwashing

PBRC addresses both. It provides a way to:

- Score and verify the impact of ocean-positive projects
- Track local benefits (like jobs created or waste removed)
- Build trust between local actors, funders, and regulators
- Link SDG 14 targets directly to business outcomes

This makes PBRC a bridge between conservation and commerce, ensuring blue economy growth stays aligned with sustainability goals.

3. Creating Jobs Through Verified Marine Actions

PBRC helps create jobs in two ways:

- Direct Job Creation Through Projects

- Verified PBRC activities often require labor and skills:
- Mangrove restoration employs planters, monitors, and nursery workers
- Plastic recovery programs create income for waste pickers and recyclers
- Reef monitoring trains local youth as divers and data collectors
- Eco-tourism guides lead PBRC-recognized tours tied to marine zones

Each of these actions earns SDG Code Points in PBRC and can be linked to income, training, or recognition.

B. Supporting Small Enterprises

When marine conservation is measured and rewarded, it creates space for:

- Seaweed cooperatives that restore seagrass while generating exports
- Fisher cooperatives that log sustainable catch data for better market access
- Eco-lodges that promote conservation-linked experiences
- Waste-to-income enterprises (e.g., making products from marine plastics)

PBRC doesn't replace enterprise, it strengthens it with data, certification, and visibility.

4. Access to Finance and Markets

Small marine businesses often lack access to credit or investment. Lenders need data. Donors need verification. Markets need proof of sustainability.

PBRC helps by:

- Providing a digital record of verified marine actions
- Linking these actions to recognized SDG outcomes
- Making community projects visible to funders and impact investors

For example:

A seaweed farm that improves coastal habitat and tracks carbon storage through PBRC can apply for blue climate finance.

A women-led beach cleanup group with PBRC scores can qualify for local government support or microloans.

This shifts the economy from extractive to regenerative and puts local actors in control.

5. Policy Link: Blue Economy Strategy and PBRC

- Indonesia's national blue economy strategy focuses on:
- Restoring marine ecosystems
- Strengthening sustainable fisheries
- Improving marine tourism
- Supporting innovation and technology
- Reducing marine pollution

PBRC fits into all five areas by offering:

- Strategy Focus: How PBRC Helps
- Ecosystem restoration verifies and scores coral/mangrove recovery
- Sustainable fisheries Tracks catch data, IUU patrols, and quota compliance
- Marine tourism logs eco-tourism activities tied to conservation zones

- Innovation and tech connect with sensors, GPS, and AI tools
- Pollution reduction Measures impact of waste collection and recycling
- By using PBRC, local projects can align directly with national priorities and qualify for scale-up support.

6. Youth, Training, and Future Jobs

Indonesia's coastal population includes millions of young people. PBRC can be used as a platform to train and engage them in ocean-positive careers.

Use cases:

- Student training in PBRC data collection, reef surveys, and coastal mapping

- Marine conservation internships that count toward PBRC projects
- School competitions that log community actions for SDG 14 credit
- Job pathways for PBRC-trained youth into NGOs, eco-tourism, or marine start-ups

This gives young people a reason to stay in their communities, not just as workers, but as marine stewards.

7. From Short-Term Projects to Long-Term Livelihoods

Too often, ocean projects are short-lived, grant-funded for one year, then forgotten. PBRC offers a longer-term model. It allows local actors to:

- Show impact over time

- Build partnerships with funders
- Track outcomes and adjust strategies
- Maintain momentum with visibility and rewards

This supports livelihoods, not just labor. It shifts the mindset from temporary aid to ongoing opportunity.

Conclusion: Data as a Driver of Coastal Prosperity

The ocean can be a powerful engine of jobs, income, and community wellbeing. But only if managed with care, and only if local actors can prove the value they create.

PBRC provides the tool to do exactly that. By verifying marine actions and linking them to SDG 14, it turns conservation into measurable economic value, a value that communities can use to build stronger, more sustainable futures.

In the next and final chapter, we will look at what it takes to future-proof PBRC, ensuring it remains a living, adaptable system ready to support Indonesia's marine goals in the years ahead.

Chapter 8: Risks, Ethics & Monitoring

Keeping PBRC Accountable, Inclusive, and Adaptable

No system is perfect, including PBRC. While it offers a practical and measurable approach to marine regeneration, it must be built and applied with caution. As PBRC grows, risks must be understood early, ethical standards must guide implementation, and a system of independent monitoring must ensure it serves the people and ecosystems it was designed to protect.

This chapter explores the key risks, ethical concerns, and long-term monitoring strategies tied to PBRC. It offers simple, actionable insights for strengthening trust and fairness in how the tool is used, especially across Indonesia's diverse coastal communities.

1. Technology Limitations

While PBRC relies on technology (GPS, satellite, sensors, mobile apps), not every region has equal access or capacity to use it. Poor internet coverage, limited smartphone use, or low digital literacy can create gaps.

Risk:

Some communities may be left out or underrepresented because they lack access to tools that allow their actions to be verified and scored.

What to Do:

- Ensure offline functionality in PBRC mobile tools
- Provide training and equipment support in remote areas
- Design low-tech alternatives (e.g., paper-based logs with third-party verification)

- Avoid making digital access a condition for inclusion

PBRC must not become a “rich data–rich reward” system. The goal is full participation, not just easy verification.

2. Data Misuse and Privacy

As PBRC collects data on locations, actions, and outcomes, there's a risk of unintended use, especially if personal or community-level information is shared without consent.

Risk:

Data could be used for surveillance, commercial exploitation, or political manipulation.

What to Do:

- Build strict data privacy rules into the PBRC framework
- Use consent-based data collection with clear opt-in choices
- Limit the use of personal identifiers unless essential
- Store data securely with limited access

All participants, from a village leader to a student volunteer, must know how their data will be used and why it matters.

3. Greenwashing and Point Manipulation

Because PBRC awards Code Points for verified actions, there's a risk that some actors may exaggerate results, fake outcomes, or manipulate data to gain rewards or recognition.

Risk:

Inflated scores and fake projects could damage the system's credibility.

What to Do:

- Include third-party spot checks and ground-truthing
- Use AI and satellite tools to cross-verify unusual claims
- Publish a public dashboard showing all verified projects
- Encourage peer review from local NGOs and academic partners

The integrity of PBRC depends on independent review and community oversight, not just self-reporting.

4. Exclusion of Indigenous and Local Knowledge

Marine knowledge in Indonesia is often passed through generations, not always recorded in formal reports or digital tools. If PBRC only counts actions that fit into Western-style metrics, it may ignore traditional methods that work.

Risk:

Local wisdom and low-tech practices could be overlooked or undervalued.

What to Do:

- Involve local leaders and elders in PBRC scoring guidelines
- Create categories for cultural practices that support SDG 14 (e.g., traditional no-fish zones)
- Allow PBRC to recognize oral reporting and participatory validation

- Document non-digital marine stewardship as a legitimate action

Inclusivity is not just about access; it's about respecting different ways of knowing and protecting the ocean.

5. Unintended Economic Pressure

If PBRC-linked rewards or funding become large-scale, communities may begin focusing only on "high-point" activities, neglecting others that are equally important but harder to measure (like slow, long-term coral recovery).

Risk:

Communities may shift from balanced ocean care to point-maximization.

What to Do:

- Design PBRC scoring to balance short- and long-term value
- Limit reward systems to community-level recognition, not per-action payments
- Encourage multi-year impact tracking over single events
- Promote a diverse portfolio of activities, not just “easy wins.”
- PBRC should guide behavior, not distort it. Long-term restoration must stay at the center.

6. Monitoring for the Long Haul

For PBRC to remain effective, it must be reviewed and improved regularly. What works in Year 1 may not be enough by Year 5. Climate, policy, and community dynamics will change, and PBRC must adapt.

What to Do:

- Set up a national review committee to audit PBRC tools every 2–3 years
- Use feedback loops from pilot sites and users to fix issues
- Partner with universities to conduct longitudinal impact studies
- Allow public comment periods on scoring frameworks and system updates
- Monitoring is not just about oversight; it's about learning and evolving.

7. Ethical Leadership and Community Consent

PBRC will only succeed if it is trusted. That trust must be built on transparency, shared governance, and a strong ethical foundation.

Key Principles for Ethical Use:

- Free, Prior, and Informed Consent for all participants
- Transparency in how points are assigned and verified
- Equity in how different groups are represented and rewarded
- Non-exploitation of local efforts or data for outside gain
- Any PBRC expansion should begin with a simple question:
- “Does this strengthen the community’s voice, or reduce it?”

Conclusion: A System Worth Guarding

PBRC offers powerful potential. But with power comes responsibility. To protect Indonesia’s ocean

future and the people who live closest to it, the system must be built on fairness, ethics, and openness.

Risks must be met early, not after harm is done. Communities must be seen as partners, not data sources. And all technology must serve a human goal: long-term marine recovery, led by those who depend on it most.

As PBRC moves into wider use, ongoing reflection, course correction, and strong monitoring are not just recommended; they are essential.

Conclusion: Turning Commitment into Measurable Change

- **Indonesia's ocean** is not just a natural treasure. It is a living system that supports millions of lives through food, jobs, culture, and climate resilience. From the coral reefs of Raja Ampat to the mangrove swamps of North Kalimantan, every coastal ecosystem plays a role in keeping both nature and society balanced.
- **But the challenges are real**: rising sea levels, plastic pollution, illegal fishing, and coral degradation are not abstract problems. They are daily realities faced by communities and decision-makers alike.

The Planetary Blue Regeneration Code (PBRC) was developed as a direct response to these realities. It is not a theory or a campaign. It is a tool. A system built to do one job: track and verify ocean-positive actions,

then connect those actions to policies, incentives, and long-term value.

Over the last eight chapters, we have explored how PBRC works, where it fits, and why it matters.

What We've Learned

1. **Indonesia is facing urgent marine threats**: from reef loss and acidification to overfishing and unregulated coastal development. These issues are deeply tied to economic inequality and governance challenges.

2**. Global marine technologies are evolving**, with AI, IoT, and remote sensing offering new ways to monitor and manage marine ecosystems. PBRC fits into these advances by providing a common framework for tracking impact.

3**. PBRC translates SDG 14 into action**: linking specific marine tasks (like coral planting or pollution removal) with a scoring system that can be used by local leaders, national policymakers, and international funders.

4. **Real-world pilots show what's possible**: when PBRC is used in coastal villages, community members are empowered to take ownership of conservation work, and their efforts are verified and rewarded.

5**. Policy integration is the next step**: PBRC must be scaled through inclusion in local zoning plans, national SDG frameworks, community grants, and the country's broader Blue Economy strategy.

6**. It's more than data, it's livelihoods**: PBRC opens new doors for job creation, youth training, eco-

enterprises, and financial access in underserved coastal areas.

7**. But it must be ethical**: any tool that uses data and verification must be designed for fairness, protect privacy, and center the voices of the people doing the work.

What Happens Next

Indonesia has the chance to lead by example. With the right support, PBRC can become a national framework

for ocean SDG delivery trusted by policymakers, communities, researchers, and funders.

To do this, key steps include:

- Creating a national PBRC hub to guide rollout, data collection, and verification
- Integrating PBRC into local marine spatial plans and zoning enforcement
- Providing training and tools to coastal villages, fisher groups, and youth
- Aligning PBRC with investment and ESG reporting frameworks
- Ensuring that ethical, community-led monitoring remains at the core.

PBRC is ready, and Indonesia is ready too.

Final Message to Stakeholders

- If you are a policymaker, use PBRC to back your strategies with real data and gain visibility for your region's ocean efforts.
- If you are a community leader, use PBRC to document and share the work your people are already doing and to receive credit for it.
- If you are a researcher, test PBRC, improve it, and help make it more precise and inclusive.
- If you are an investor or donor, trust PBRC to give you clear, verified reporting that aligns with your environmental and social impact goals.
- And if you are a student or young activist, see PBRC as a way to turn your ideas into measurable change.

Introduction: Why Ocean Conservation Matters for People.

- Indonesia's identity is rooted in the sea. With more than 17,000 islands and some of the richest marine life on Earth, the ocean is part of daily life for millions of people. It is a source of food, jobs, knowledge, and cultural heritage. From fishing families in Sulawesi to seaweed farmers in Nusa Tenggara, people depend on the ocean not only to earn a living but to survive.
- But that connection is under pressure. Our oceans are facing serious threats. Coral reefs are bleaching and dying. Fish are becoming harder to catch. Waste from cities and industries is polluting coastal waters. Plastic fills the beaches. In many places, storms are stronger, and sea levels are rising. The damage is real, and it affects real people.

- This is not just an environmental problem. It is a social and economic issue. When marine ecosystems break down, it hits coastal communities first. Small-scale fishers struggle to feed their families. Prices rise at the market. Tourism jobs disappear. Children lose their chance to learn traditional skills. Women who rely on small seafood businesses lose income. Whole communities are pushed into deeper poverty.
- That is why ocean conservation matters. It is not just about saving fish or protecting coral. It is about **protecting people and their health**, **their work, and their future**. When the ocean is healthy, communities are stronger. When we take care of marine resources, we build resilience against poverty, hunger, and climate change.
- In Indonesia, this is especially important. The country has one of the largest fishing populations in the world. Over half of its people live within 50

kilometers of the coast. Many rely directly on the sea for food and income. That means protecting marine life is also about protecting human life.

- The **good news is that local people already hold the key. Villagers, teachers, fishermen, youth groups, and women's association**s all know the land and sea better than anyone. They notice changes early. They understand local needs. What is needed now is support: practical tools, clear knowledge, and real opportunities to lead local solutions.
- The PBRC approach is built for this**. It brings science and innovation into local hands**. It helps communities use marine resources in smarter, safer ways, like eco-tourism, seaweed farming, sustainable fishing, and marine education. It also respects traditional knowledge and works with what people already know and practice.

- For **NGOs, this offers a path to real, lasting impact.** For teachers, it creates learning moments that are close to home. For social workers and local leaders, it gives new ways to solve old problems. And for communities, it offers hope not as a big promise from far away, but as something real and achievable.
- Ocean conservation is not a choice between people and nature. It is a chance to strengthen both. When local communities are involved and empowered, they can protect the sea not just for today, but for the future. That future starts now, and it starts with us.

Chapter 9: Community Life & Oceans

Stories and the Daily Impact of the Sea on Local Life in Indonesia

- In Indonesia, the sea is more than a body of water. It is a neighbor, a provider, and sometimes even a protector. For coastal communities, the ocean shapes the rhythm of daily life from morning fishing trips to evening meals, from children playing near the shore to elders telling stories of past storms and big catches. Across the islands, people live close to the sea in ways that are both practical and deeply personal.
- Let's start in North Sulawesi, in a small fishing village near Manado. At dawn, Pak Rudi, a 48-year-old fisherman, pushes his small wooden boat into the waves. He doesn't use GPS or modern tools, just his eyes, his instincts, and years of knowledge passed down from his father and grandfather. He

knows where the fish are likely to be, depending on the tides and the wind. Some days he returns with a good catch; other days, the ocean is quiet. But either way, his life depends on that journey.

- Back on land, his wife, Ibu Sari, waits to clean, sort, and sell the fish. She sells them at the local market or to neighbors who rely on fresh seafood for their daily meals. Her income supports school fees for their children and covers basic needs. Their entire household economy flows directly from the sea.
- This story is not unique. Across Indonesia, from the coasts of Sumatra to the shores of Papua, thousands of families share the same connection. Seaweed farmers, shell collectors, boat builders, fish sellers, and coastal guides all depend on marine resources. Even those who are not directly involved in fishing still feel the impact. Local schools often adjust their hours around fishing schedules. Community events

are planned around the tides. Local dishes are built around what the sea gives each season.

But as the ocean changes, so do these lives.

- **In Lombok**, for example, **many women once earned a steady income from collecting shellfish** and small crabs during low tide. Now, with reef damage and increased pollution, their harvests are smaller. Some have given up. Others walk further out, putting themselves at risk. These small shifts add up. When a mother can no longer earn from the sea, her family feels the pressure. When fishers return with fewer fish, the whole village feels it.
- In Java, coastal erosion has taken away homes. In Central Kalimantan, mangrove destruction has led to more flooding. These environmental changes affect everything, including housing, food prices, education, and even health. The ocean is not just part of the scenery; it is tied to survival.

- Yet despite these challenges, communities continue to adapt. In Wakatobi, a group of young people started a coral restoration effort after noticing their reef was dying. They learned basic conservation methods, worked with local dive operators, and turned their efforts into a community project. It brought tourism back to the village and created pride among the youth.
- In another example, a women's group in Maluku began a small seaweed farming cooperative. With basic training and support, they turned unused coastal areas into a steady income source. Seaweed is less harmful to the ocean than other activities and provides income even when fish are scarce.

These stories show that people are not just victims of change – they can be leaders in solutions.

But they need support.

- Many small communities don't have access to the tools, training, or funding needed to make these

efforts grow. They may not know how to access government programs or conservation grants. In many cases, they are left out of decision-making processes that affect their coastline.

- This is where NGOs, teachers, and social workers play an important role. You are the link between big ideas and everyday lives. You help people understand not just what is happening to their environment, but what they can do about it. You bring new tools, new knowledge, and often, new hope.
- For example, teachers can use local marine issues in science lessons. A simple classroom activity about coral or plastic waste can spark curiosity and awareness. Social workers can help women's groups or youth clubs connect with training programs. NGOs can help translate policies into action by guiding communities step by step through sustainable projects.

- When local people are involved, and when their knowledge is respected, conservation becomes something practical, not just a theory. It becomes a way to secure better food, a more stable income, and a cleaner place to live.
- The sea will always be central to Indonesian life. But how we care for it now will decide how much it can continue to give. Communities already carry the wisdom and strength to protect it. What they need are partnerships, not charity, but real collaboration. Together, we can make sure the sea continues to feed, teach, and sustain generations to come.

Chapter 10: Common Marine Issues

Plastic Pollution, Illegal Fishing, and What People See and Feel

- Across Indonesia, the signs of ocean damage are easy to see. You don’t need to be a scientist to notice that the sea is not what it used to be. People feel it in the fish they no longer catch, the beaches they no longer enjoy, and the changes in their daily routine. These changes are not small. They affect health, food, income, and even the way people think about their future.
- One of the most visible problems is plastic pollution. Walk along many coastlines from Bali to Batam, and you will find plastic bags tangled in mangroves, bottles floating in the water, and foam containers buried in the sand. It’s not just an eyesore. It’s dangerous. Sea turtles often mistake plastic for jellyfish and eat it, which can kill them.

Fish ingest microplastics, which then make their way into our food. Many families rely on fresh seafood for protein, but now some are beginning to question if the fish is still safe to eat.

- Children playing near the water are also at risk. In some areas, sharp plastic and trash make beaches unsafe. Some parents stop letting their kids swim or play near the sea. Over time, this breaks the bond between the next generation and the ocean. What was once a place of learning and joy becomes something to avoid.
- People often ask, “Where does all this plastic come from?” The truth is, it comes from many places. Some of it is local waste thrown into rivers or drains that ends up in the sea. Some comes from cities, where waste systems are not strong. Some comes from other countries, carried by ocean currents. But no matter where it starts, the impact is

felt locally. And coastal communities are the ones left to clean it up or live with the mess.

- Illegal, unreported, and unregulated fishing (IUU fishing) is another major issue. Many local fishers have noticed fewer fish near the shore. They have to go farther out to sea, spend more on fuel, and still come back with smaller catches. Some blame foreign fishing boats, which often enter Indonesian waters and take large amounts of fish without permission. These boats often use methods that damage the sea floor and kill young fish, making it harder for local ecosystems to recover.
- In some areas, even local fishers use harmful techniques like cyanide fishing or small-mesh nets that catch everything, not just adult fish. Most do not mean harm; they are simply trying to survive. When income is low and demand is high, people use whatever method they can to make ends meet. But the long-term damage is real.

- The problem is made worse by weak enforcement. Even when illegal activities are reported, there is often no follow-up. Local leaders may not have the power or resources to take action. Fishermen who follow the rules feel discouraged, seeing others profit from breaking them.
- This creates tension in communities. It also makes it harder to convince people to fish responsibly or support marine protection efforts. Why should one person make sacrifices when others are allowed to take without limits?
- Beyond fishing and waste, people are also noticing changes in the weather and sea patterns. Older villagers speak of how the seasons are shifting. The rain comes at the wrong time. Storms are stronger. Sea levels are rising. In places like Jakarta Bay and parts of Central Java, land is already sinking. Saltwater is creeping into freshwater sources, ruining crops and drinking water.

- These are not distant warnings. These are everyday realities. When fishermen don’t catch enough, their children may miss school. When flooding damages homes, families are forced to move. When tourism declines due to dirty beaches, young people lose jobs. The ocean’s health and the people’s well-being are tightly connected.
- But what is important to remember is this: people are not blind to these changes. They see them. They talk about them. What they often lack is the power or resources to do something about it.
- This is where your work becomes vital. As NGOs, teachers, local officials, and social workers, you are the ones who can help turn concern into action. Community clean-ups, education sessions, and local monitoring groups are not small steps; they are key to rebuilding trust and protecting the ocean from the ground up.

- You can help shift mindsets from blame to responsibility. By showing that change is possible and beneficial, you make it easier for people to care, even when they are struggling. You can connect traditional knowledge with modern tools, turning fear into strength and confusion into leadership.

ü The ocean is hurting, yes. But the people who live closest to it are the ones best placed to lead its recovery. They just need the right support and the chance to be heard.

Chapter 11: PBRC for People

Explaining PBRC in Simple Terms and Relatable Benefits

- When people hear the word “innovation,” they often imagine high-tech machines, big laboratories, or expensive systems that only experts understand. But that’s not what PBRC is about. PBRC, or Proof-Based Resource Circulation, is a simple idea: use what we already have more wisely, waste less, and create long-term benefits for both nature and people.

Let’s break it down even more.

- Think of a fishing village. Every day, fishers go out to sea and bring back what they catch. They sell what they can, cook what they need, and throw away the rest. But what if that “waste”, the fish heads, bones, leftover water, could be turned into

something useful? What if that water could be filtered and reused, or those fish parts turned into fertilizer or fish feed?

- That is one small example of how PBRC works. It's about using resources in a full circle. Nothing is thrown away unless it truly has no more use. The goal is to reduce pressure on nature and increase value for the community.
- But PBRC isn't just about fish. It applies to many things: seaweed farming, fish drying, fish transport, tourism, mangrove planting, and even school lunch programs. It helps people use what they already have more efficiently, saving money, protecting nature, and building stronger local systems.

What Makes PBRC Special?

PBRC combines three things:

1. Local Knowledge – What people already know from experience.

2. Simple Tools or Processes – These can be small machines, basic filters, solar dryers, or data sheets.

3. Clear Measurement – This is how we prove that a method works, saves money, or protects the environment. That's the "proof-based" part.

It's not about guessing. It's about showing results in real life in your village, your school, or your market.

How Does PBRC Help Everyday People?

Here are some practical ways PBRC helps communities in Indonesia:

1. Creating Jobs and Small Businesses

- In some areas, PBRC projects help women turn dried fish waste into affordable fertilizer for home gardens. Instead of burning or dumping it, they clean it, grind it, and pack it in bags. It's cheap, natural, and easy to sell. The same can be done with seaweed scraps, which can be turned into skin products or animal feed.

- This creates jobs, especially for women and youth who may not go out to sea or work in big industries. It also keeps money in the community instead of depending on expensive outside goods.

2. Saving Water and Reducing Pollution

- PBRC helps communities reuse water from fish cleaning or seaweed washing. Instead of letting dirty water flow into rivers or the sea, simple filters can clean it for reuse in gardens or household cleaning. This protects marine life and reduces sickness from polluted water.
- In some coastal schools, PBRC projects show students how to recycle water, reduce plastic, and use waste from the canteen to make compost. This builds good habits and shows children that sustainability is not a distant idea; it starts where they are.

3. Supporting Sustainable Fishing and Farming

PBRC can guide small-scale fishers on how to catch only mature fish, avoid damaging gear, and track their catch. This not only protects fish populations but also improves their income over time. When buyers know a fisher follows sustainable practices, they are more likely to pay fair prices and return for more.

For seaweed farmers, PBRC helps them measure growth, reduce waste, and choose better drying methods. Using solar dryers instead of sun-drying on the sand can protect product quality and increase its value.

4. Strengthening Community Decision-Making

Because PBRC includes data collection and visible results, it helps communities make smarter choices. For example, if a village sees that planting mangroves reduces flood damage during storms, they can show

this to local authorities and demand support for bigger planting programs.

Or if a women's group sees they can earn income from fish bone powder, they can present their results to the district and apply for small grants.

When people have proof, their voices are stronger.

Why PBRC Works in Indonesia

Indonesia is already full of local wisdom. Many communities already reuse, share, and adjust based on nature. What PBRC offers is a way to build on this knowledge with simple improvements and to track the benefits in ways that can be shown to others.

It is not a one-size-fits-all system. Each community can shape PBRC to fit their needs, whether they live on a remote island or a crowded urban coast. It respects what people already do while offering tools to make it better, cleaner, and more valuable.

And most importantly, it does not require big budgets or foreign experts. With the right guidance, local groups can start PBRC projects themselves step by step.

Who Can Use PBRC?

Teachers can use PBRC to teach real-world science and sustainability.

NGOs can use it to design projects with a measurable impact.

Social workers can use it to support women's groups, youth clubs, and micro-businesses.

Village leaders can use it to plan smarter development and protect their coastline.

Therefore:

- PBRC is not about changing everything overnight. It's about starting small, proving what works, and building trust. It's about showing that sustainability is not just for governments or scientists. It's for

everyone, for the mother drying fish, the student learning about plastic waste, the fisherman trying to protect his catch, and the teacher explaining the tides.

- When people feel that they are part of the solution, they begin to act. And when those actions are simple, affordable, and proven to work, they spread. That is how real change begins – from the ground up, with people, not just plans.

Chapter 12: Youth and Schools

The Importance of Education and Youth Leadership

- Young people will inherit the ocean. The choices we make today, how we treat the sea, what we protect, and what we pollute will shape their future. In Indonesia, where more than half the population is under 30, youth leadership and education are not just helpful; they are essential.
- Across fishing villages, coastal towns, and small islands, young people are already feeling the effects of marine decline. They see fewer fish in the nets. They see beaches covered in trash. They hear stories from elders about how things used to be when the water was clearer, the reefs were brighter, and the sea gave more than it does now.
- But many young people also feel disconnected. They go to school and learn about science from textbooks, but not always about the sea just outside

their classroom. They may know about global warming, but not how plastic from their street can end up in the ocean. This gap between knowledge and real life makes it harder for youth to understand their role or power in ocean protection.

- That's why education matters. Not just as a school subject, but as something real, local, and connected to daily life. When students learn about their environment in a hands-on way, they start to care. When they care, they start to act. And when they act, they influence other parents, neighbors, and even local leaders.
- In some coastal schools in Sulawesi and Maluku, teachers have begun using local marine examples in lessons. Science classes include the reef ecosystems found nearby. Math lessons use fish catch data. Art projects feature ocean themes. These small steps help make conservation personal. Students begin to

see the sea not as something distant, but as part of their own lives.

- Youth-led action is already showing promise. In Bali, a group of students started a weekend beach cleanup club. It began with just five members, but soon grew to 50. They partnered with a local waste bank to turn collected plastic into reusable materials. In Flores, a youth group documented plastic pollution in their village and presented it to the mayor, who then supported stronger waste management efforts. These stories show what happens when young people feel heard and supported.
- PBRC also has a role here. By offering small, proof-based projects, schools and youth groups can take part in ocean protection in practical ways. For example, students can monitor plastic use in their school, test simple water filters, or build compost bins from food waste. These projects are not only

educational, but they also create pride and build leadership.

- Teachers and social workers can help guide these efforts. You don't need to be a marine biologist. What matters is helping young people ask questions, observe their surroundings, and try small solutions. Start with what's familiar: fish markets, beach walks, home waste, seaweed farms. Every local example is a learning tool.
- Youth can also help spread awareness through storytelling, writing, videos, posters, or social media. Their voice matters. When a 14-year-old explains why plastic is choking the reef in her town, people listen differently. When youth are involved, the message feels urgent, personal, and hopeful.

To support youth leadership, they need three things:

1. Education that connects to real life, grounded in local examples

2. Opportunities to lead and act, not just listen

3. Encouragement from adults – especially teachers, parents, and local leaders

- Youth are not too young to lead. They often bring energy, creativity, and new ideas. What they need is space to speak and support to keep going.
- The ocean needs defenders in every generation. By teaching young people today, we plant the seeds of long-term care. They will become the fishers, planners, policymakers, and scientists of tomorrow. But even now, as students and community members, they have power.
- We must treat them not just as future leaders, but as current partners. Because when youth understand their ocean, they fight for it. And when they fight for it, they protect not only the sea but all of us who depend on it.

Chapter 13: Case Story – A PBRC Model in Desa Lautan Indah

A Simulated Story of How One Village Put PBRC into Action

- Desa Lautan Indah is a small coastal village in Southeast Sulawesi, home to around 400 families. Most people in the village depend on fishing, seaweed farming, and small-scale seafood processing to make a living. For years, the sea provided enough. But in recent times, the fish stocks dropped, plastic waste increased, and floods became more common during the rainy season.
- The local leaders noticed changes, too. Fishermen were returning with smaller catches. Waste from fish processing, scales, bones, and wastewater was being dumped directly into the sea or nearby rivers. The local beach, once a gathering place, was often littered with plastic and fish waste. The village

needed a change, but people didn't know where to begin.

- In 2023, a local NGO introduced the village to the PBRC concept. They explained it in simple terms: "Let's see how we can make better use of what we already have and waste less." They focused on five areas the village cared about: clean water, better fish catch value, job opportunities, safer waste management, and education for youth.

Step 1: Listening First

Before starting anything, the NGO sat with the village council, women's group, teachers, and fishers. They did not bring ready-made solutions. They asked questions:

- What's being wasted?
- What do people want to fix?
- What local skills already exist?

- The villagers shared their frustrations, especially about the smell from fish waste and the risk of water contamination. They also mentioned that many young people had left the village looking for work, and the remaining families were struggling.

Step 2: Starting Small – Fish Waste Recovery

One of the first PBRC activities was setting up a small fish waste processing area. With training, five women learned how to dry fish bones and grind them into powder. The powder was packed and sold locally as calcium-rich animal feed and fertilizer for gardens. Instead of throwing away waste, they were turning it into income.

The women tracked how much waste they processed, how much income they earned, and how much was kept out of the sea. After three months, they had clear data: 120 kg of waste turned into 80 packs of fishbone

powder, bringing in nearly Rp 2 million in total. The proof was real and visible.

Step 3: Reusing Water in Seaweed Farming

Seaweed farming was popular in the village, but many farmers complained that washing seaweed required large amounts of clean water. Through PBRC, the community installed a simple water recycling system. Water used to wash the seaweed was collected in a tank, filtered using sand and charcoal, and reused two or three more times before being released.

This reduced freshwater use by over 40%. Farmers saved time and money, and the surrounding coastal water became cleaner. It also became a model project for nearby villages.

Step 4: Youth Involvement and Schools

Teachers from the village primary school were trained to include PBRC themes in their lessons. Students

learned to map plastic waste in the village and helped sort recyclables at school. They also visited the women’s fish powder group and interviewed them about their work. A group of students even made posters about ocean health that were displayed at the village hall.

One 13-year-old student, Sari, wrote a short story about a sea turtle trapped in plastic. Her story was read aloud during village prayer meetings and sparked new conversations about plastic use.

Step 5: Growing Local Ownership

After six months, the PBRC's ideas had spread beyond the original group. The village chief included PBRC in the village planning document. A youth group started composting food waste. A fisherman began experimenting with ice made from recycled water to preserve his catch longer.

What made it work? Three things:

- The ideas were simple and practical.
- Progress was measured and shared.
- The process respected local culture and involved everyone.

Lessons from Desa Lautan Indah

- This story shows how PBRC is not about big change overnight. It's about taking what's already there and improving it step by step. For Desa Lautan Indah, the key was building trust, starting small, and proving success with data and stories people could understand.
- Today, the village is not perfect, but it's more hopeful. The beach is cleaner. Waste is reused. Youth are involved. The ocean is still at the center of life, but now, people are more aware of how to protect it, not just for themselves, but for their children.

- And that’s what PBRC is really about: giving people the tools to create local solutions that work for the sea and themselves.

Chapter 14: What You Can Do Next – A Community Call to Action

- Ocean conservation is not something that belongs only to scientists or government officials. It belongs to all of us. Whether you live in a fishing village, run a school, lead a youth group, or work in a coastal market, your daily choices and actions can help protect the sea.
- The PBRC model shows that even small steps, when backed by local knowledge and real proof, can create lasting change. Now the question is: what's next?
- This final section is about moving from awareness to action. What can you do in your role today, this week, or over the next year?

1. Start Where You Are

You don't need to wait for outside funding or a big program to begin. Look around your home, workplace,

or village. What's being wasted? What could be reused or made useful again?

For example:

- If you're a fisher, track how much fish waste you discard and explore simple uses like drying, composting, or fishmeal.
- If you're a teacher, add ocean protection topics to classroom activities, even small posters or a clean-up day, make a difference.
- If you work in a market, try reducing single-use plastic and encourage your customers to bring containers or bags from home.
- These may seem like small acts, but they build momentum. They make others notice and get involved.

2. Form a Local Group

- Change is easier when you're not alone. Form a small group in your village, school, or

neighborhood. Start with a clear, simple purpose like reducing plastic use, reusing water, or improving waste separation.

- Invite others who are interested. Include elders, women, youth, and religious leaders. The more diverse the group, the more ideas and support you'll have.
- Use the PBRC concept as your guide:
- “How can we use what we already have more smartly?”

3. Document What You Do

- One of the most powerful parts of PBRC is showing proof. If you try something new, keep a record.
- Take before-and-after photos.
- Keep count (e.g., kilos of plastic collected, litres of water saved, number of students involved).
- Share your story with your community.

- When you show others what works, they're more likely to follow. Local leaders are also more likely to support a project that already has results.

4. Involve Youth

- Young people bring energy, ideas, and creativity. They can lead campaigns, start school gardens, do storytelling projects, or monitor plastic waste. Many young people are already active online and support them in using social media for ocean protection.
- You can create a "PBRC Youth Taskforce" or even hold a simple competition:
- "What can your group reuse or redesign to reduce marine harm?"
- Give recognition, not just prizes. Let youth see that their ideas matter.

5. Share Knowledge Across Villages

- What works in one place can inspire another. If you've found a good idea, a way to recycle fish waste, a simple water reuse method, or a good

teaching tool, share it. Call nearby schools, speak at village meetings, or post it online.

- Communities grow stronger when they learn from each other. No need to wait for experts or consultants. Local solutions from local people are powerful.

6. Link with Policy and Support

If your group or project is growing, it's time to link up with local government, NGOs, or development programs. Use your results as evidence. Ask for small support:

- Training sessions
- Basic materials
- Public space for community events
- Help with scaling up

Make sure your voice is heard when coastal planning or marine decisions are being made. Show that PBRC is not a theory, it's an action.

7. Keep the Spirit Going

Change doesn't happen overnight. Some days will feel hard. People may doubt your efforts or say, "It won't work." But keep going. PBRC is about steady, local action backed by proof. You don't need to save the entire ocean. You just need to care for your piece of it and help others do the same.

- Encourage others, celebrate small wins, and remember: when many small efforts join together, they become something big. Final Words
- Indonesia's ocean is rich and full of life, but it needs us. It needs teachers who teach with purpose, fishers who fish with care, leaders who plan with wisdom, and youth who rise with vision. PBRC is one tool to help communities grow stronger while protecting the sea they depend on.

- This is not someone else’s responsibility. It’s ours. Together, step by step, we can turn everyday habits into lasting change.
- The ocean has given so much. It’s time we give back.

Chapter 15: The Bleached Shore

- Tari woke up to the sound of waves, as she always did. The sea had been her lullaby since she was born in a small village on the coast of Sulawesi, Indonesia. Her father was a fisherman, and her mother made dried seaweed to sell at the market. The ocean wasn't just part of their lives; it was their life.

But lately, the sea had started to feel... different.

- Tari stepped outside, sand still cool under her bare feet. She looked out at the water. It was calm, but the usual sparkle was gone. The water looked pale and dull. It wasn't just her imagination.
- A few months ago, Tari had gone snorkeling with her cousin Budi near the coral reef that

hugged their village. It used to be full of colors: reds, oranges, purples, and blues. Fish of all shapes darted through it like a rainbow underwater. That day, though, the reef looked sick. The coral was white, bone-white, like something had drained all the life out of it.

- "Coral bleaching," her teacher had explained when she asked. "It happens when the water gets too warm. The coral becomes stressed and pushes out the algae that keep it alive. Without algae, it turns white and starts to die."
- Tari didn't know what to say to that. She thought coral only died if people broke it. But now, it was the heat, heat that no one could touch or fix with their hands.
- Her father didn't talk much about it, but she saw it in the way he stared at his fishing net

every evening. The catch was smaller now. Some days, he came back with nothing. Once, he said, “Maybe the fish have gone to cooler places.” He tried to laugh, but it wasn’t funny.

- Tari sat on a rock and watched a crab skitter across the shore. Even fewer crabs seemed to be around now. She remembered when she was younger, the beach was full of them. She and Budi would race to catch the little ones and put them in buckets before letting them go again.

Now, the beach was quiet.

- At school, her class had started learning about something called “SDGs.” Sustainable Development Goals. There were seventeen of them, her teacher said, and each one was important to the world. The one that caught

Tari's attention was SDG 14—Life Below Water.

- "It's about protecting the oceans and everything that lives in them," her teacher had explained. "It means we have to think about how we treat the sea. How do we fish? What we throw in the water. And how do we protect our coral reefs?"

- Tari remembered raising her hand. "But how can we protect the sea if we don't even know what's hurting it?"
- Her teacher smiled. "Good question, Tari. That's why we learn. That's why we try new ideas."

That's when she heard about PBRC.

- “Plastic Bank Recycling Credit,” the teacher had said, writing it on the board. “It’s a system that rewards people for collecting plastic waste. Instead of throwing plastic in the sea or burning it, they bring it to a center. The plastic is weighed, recorded, and exchanged for money or goods. It's like recycling with purpose.”
- Tari had seen trash float in the ocean. Bottles, wrappers, even shoes. Sometimes it ended up on the beach. Some of it was tangled in fishing nets or choked the sea turtles. She always thought of trash as something far away, from the cities or tourists. But now she realized even the little things from her village could be part of the problem.

- She looked down at the sand near her feet. A faded blue candy wrapper flapped in the breeze.
- Tari picked it up and held it in her hand. It was small, but maybe it mattered. Maybe everything started small.
- She glanced back at the water. The sea looked tired, like it was asking for help.
- Tari didn't know what she could do yet. But she felt something stir inside her, a mix of sadness and hope.

➢ The reef was hurting.
➢ The fish were leaving.
➢ But maybe, just maybe, there was a way to help.
➢ And she was going to find it.

Chapter 16: Nia’s Secret

- Tari’s grandmother, Nia, didn’t go to the shore much anymore. Her legs were weak, and the salty wind sometimes made her cough. But when Tari came home from school each day, Nia was always sitting on the front porch,

weaving baskets or peeling dried cassava with her thin fingers.

That afternoon, Tari dropped her school bag and sat beside her.

"Did you know the coral is dying?" she asked.

Nia nodded slowly. "I've known for some time, little fish."

"Why didn't you tell me?" Tari frowned.

Nia paused. "Because sometimes, people don't want to hear sad things. Even when they need to."

- Tari didn't say anything. She just looked out at the sea, like her grandmother often did. The tide was low. A few fishing boats bobbed in the distance.

“When I was your age,” Nia began, “the reef was bursting with life. Your grandfather and I used to dive down with only goggles made from glass bottles and rubber. We knew every fish by color, every rock by shape.”

- Tari smiled. She loved her grandmother’s stories. But today, she was looking for more than memories.

“Did you ever hear about machines that help the sea?” she asked suddenly.

Nia looked surprised. “Machines?”

“Yes,” Tari said. “Like something that helps coral grow, or collects plastic. My teacher says there are new inventions, marine technologies. Things that can clean the water.”

Nia chuckled softly. “You think old people don’t know about such things?”

Tari shrugged. “Well, do you?”

- Nia leaned closer and lowered her voice. “I’ll tell you a secret. Your great-uncle used to work on a floating lab. Not far from here. It wasn’t big, but they had solar panels and strange-looking tools. They tested the water. They even built something called a ‘reef frame’ made of iron.”

Tari’s eyes widened. “What’s that?”

“It’s like a metal skeleton they put in the sea. Coral attaches to it and grows faster, stronger. Fish come back. It becomes a new home.”

“Why didn’t you tell anyone?” Tari asked, amazed.

“People didn’t care back then. They thought the sea would always take care of itself. But your uncle believed we had to help it. He said the sea gives us everything. Food. Rain. Life. So we must give something back.”

Tari leaned against her grandmother. “I want to help too.”

- Nia patted her arm. “You can. You already care. That’s the first step.”
- Tari thought about the PBRC system her teacher had mentioned. Collecting plastic, logging it, turning it into something useful. Maybe she could combine the old stories and the new ideas. Maybe there was a way for the village to join something bigger.

- She looked up at Nia. “What happened to the floating lab?”
- “It’s still there, I think. Hidden past the mangroves. No one visits it now. People forgot.”
- “Then let’s go,” Tari said.
- Nia laughed. “You’ll need a boat. And someone brave enough to go with you.”
- “I’ll ask Budi,” Tari said. “He won’t say no.”
- Nia looked at her granddaughter with a mix of pride and worry. “The sea is changing, Tari. But so are the people. Some forget. But some like you remember what matters.”
- Tari squeezed her hand. “Then let’s remind the others.”

Chapter 17: Beneath the Tide

- The next morning, Tari and Budi paddled out in a small wooden canoe. The sun was still low, and the sea shimmered like glass. Nia had told them where to go beyond the mangroves, where no one fished anymore.
- They passed through thick roots and narrow water paths, listening to the calls of birds overhead. Tari felt nervous. The air smelled different here, damp and heavy. Like the place had been waiting a long time to be found.

“There!” Budi pointed.

At first, it looked like part of a broken boat. But as they came closer, they saw a platform floating just above the water. It was held up by blue barrels and

covered in solar panels, tangled wires, and metal frames half-submerged in the sea.

“It’s real,” Tari whispered. “The lab.”

- They tied their canoe to a rusted hook and stepped onto the platform. It creaked under their weight. A wooden shack stood at the center, its door half open. Inside, old notebooks lay scattered on a table. A dusty laptop sat in one corner, too old to work.
- But what caught Budi’s eye was something in the water.
- “Tari,” he said, crouching near the edge. “Come look at this.”
- Below the surface, bolted to the seabed, was a strange device. It looked like a tall box with round pipes sticking out of it. Plastic bottles

and trash were slowly being sucked into the pipes. A blinking light on top flashed green.

“It’s still running,” Budi said.

- Tari leaned closer. There was a logo on the side of the box. Three letters: PBRC.
- “Plastic Bank Recycling Credit,” she said. “This must be one of the machines my teacher talked about.”
- “But why is it out here?” Budi asked.
- “Maybe your dad's brother helped set it up,” she replied. “Nia said he worked here.”
- They found more signs of small cameras, underwater cages for fish, even old posters explaining how plastic waste was turned into pellets and reused to make new things. It was

like a forgotten project, left to survive on its own.

- ✓ “It’s collecting the plastic and logging it,” Tari said slowly. “But no one’s here to report it. No one’s checking the credits.”
- ✓ “Then let’s do it,” Budi said. “We’ll collect plastic from the village and bring it here. We’ll weigh it. Keep a record. Maybe we can send the data to someone. The machine still works.”

Tari smiled. “We could turn this into something real again.”

- They spent the rest of the day cleaning around the platform. Budi cleared tangled seaweed from the pipes. Tari found a working flashlight and checked under the planks for damage.

- Before they left, she took one of the old notebooks. The pages were filled with hand-drawn maps, notes about coral health, and charts showing how much plastic had been collected each week.

One note caught her eye:

- "If this machine keeps running, maybe the sea still has a chance."
- That night, back in her room, Tari opened the notebook again. She made a plan. She would tell her teacher. She would tell the village. They would start small. Just like the machine had.
- She smiled to herself.
- The sea had called for help.
- And she had found the answer.

Chapter 18: Reef Awakens

- In the weeks that followed, something unexpected happened. The children returned to the secret lab under the mangroves every day. They spent time collecting plastic, checking the old device, and even cleaning up around the platform. Each afternoon, after school, they would ride their small boats to the spot where the strange machine had been found.
- One morning, Tari and Budi were careful as they approached the area. The sea was calm and bright. Tari could not help but notice a change near the old coral reef. The water was clearer than before, and the reef itself looked different. There were faint splashes of color along the white coral. They swam near the reef

and saw that small patches of red and blue were starting to appear on the bleached rocks.

“Look, Budi,” Tari said, pointing. “The coral is changing.”

- Budi swam over closer, his eyes widening with wonder. “I never thought this could happen. The reef seems to be coming back to life.”
- They remembered how their teacher explained that coral is not only important for fish but also for the whole sea. The children felt that the healing of the reef was like the sea answering their call for help.
- When they returned to the village that evening, the news spread quickly. Fishermen and neighbors gathered on the beach to talk about what they had seen. Some were surprised while

others remained doubtful. Yet, the children's excitement was hard to ignore.

- At the village meeting held under the old banyan tree, elders sat in a semicircle and listened as Tari spoke. "We went to the reef, and it is healing. The colors are starting to show again. I believe the machine is working, and it is helping not just the plastic, but the sea too."
- An elder named Pak Darto crossed his arms. "It is hard to believe. We have seen the sea change before, but never has it healed so quickly."
- Tari looked at him with calm determination. "I know it is hard to understand. But we have proof. I found a notebook at the platform that says if we keep the machine running, there is a chance for the sea. We must try small steps,

like the plastic collection and the clean-ups we do."

- Another elder, Bu Sari, added softly, "Maybe the sea is giving us another chance. When I was young, my mother told me stories of a time when the ocean was full of wonders. Perhaps we can bring back those days."

- The discussion turned hopeful. Families in the village began to talk about ways to help the ocean. Some fishermen pledged to be more careful with their nets. Women in the community started organizing clean-up days for the beach. Even those who had been skeptical seemed willing to give the children a chance.

- Over the next days, as more people joined in the efforts, the reef continued to change. The machine, forgotten at first, now gathered plastic waste that was later recycled. Its blinking light became a beacon of new hope. The villagers, inspired by the children's energy, began to value the sea even more. They saw the connection between a clean ocean and a thriving life on land.
- Tari and Budi also noticed that more fish returned. Small schools of fish were seen swirling around the recovering coral. The simple acts of cleaning up the beach and collecting trash had rippled through the community. Each morning, as the sun rose, a renewed sense of responsibility and hope was felt among everyone.

- The reef was no longer just a stretch of broken white coral. It was a sign that healing was possible if everyone worked together. The sea had begun to awaken, and with it came a promise, a promise that even nature, with the right care, could renew itself.
- For Tari, that day ended with a quiet satisfaction. She sat by the water and watched the gentle waves kiss the shore. The reef was beginning to show its true colors again. And deep in her heart, she believed that the work they had started was only the beginning of a brighter future for all life below water.

Chapter 19: The Conflict

The reef was healing, and the village was changing.

But not everyone was happy.

- One morning, two strangers arrived in the village. They wore matching shirts, had walkie-talkies, and carried clipboards. They introduced themselves as officers from the District Environmental Office. Word had reached them about a "mysterious machine" in the sea and a group of children running a recycling operation without permission.

Tari and Budi were called to the meeting hall.

- "We received a report," said one officer, a tall man with sunglasses. "There is an unregistered device operating in protected waters. This is a violation of maritime regulations."

- “It’s not dangerous,” Tari replied, her voice calm but firm. “It’s helping. The reef is growing again.”
- “That may be,” said the second officer, flipping through her papers. “But you are children. This system needs government approval. Who owns the device? Who is logging the plastic? Where is the data going?”

Tari glanced at Budi, unsure what to say. They had only been trying to help.

Budi stepped forward. “We found the machine. It was already working. It’s a PBRC unit. We’ve been collecting plastic and recording everything in the notebooks. We can show you.”

The officers looked at each other. One scribbled note.

- “This PBRC system,” said the man, “belongs to an international program. If you’ve been interfering with it, there could be consequences.”
- Word spread fast. By that evening, the village was divided.
- Some villagers supported the children.
- “They brought back the fish!” said one fisherman. “The coral is healing.”
- “They did what no one else dared to try,” added Bu Sari.
- But others were nervous.
- “What if the government shuts down the lab?” one man asked. “We could be fined.”
- “Let the officials handle it,” someone else muttered. “Children shouldn’t be involved.”

- ✓ At home, Tari sat quietly with Nia. She felt tired, like the ocean's weight had settled on her shoulders.

"You did something brave," Nia said gently.

- "But maybe I made things worse," Tari replied.
- Nia shook her head. "You opened people's eyes. That always brings noise. Not everyone will understand right away."
- The next day, the officers visited the platform. They inspected the machine, took photos, and collected the notebooks. When they returned, their tone had changed.
- "This unit was part of a pilot project," the woman explained. "It was abandoned years ago. But the records you kept are detailed.

Someone at PBRC headquarters might want to see this."

"So we're not in trouble?" Budi asked.

- "We still need to report everything," she replied. "But what you did… it matters."
- Later that week, a letter arrived. It was from the PBRC main office in Jakarta. They had seen the logs and photos. They wanted to speak to the village.
- Tari read the letter aloud during the evening gathering. "They are interested in helping us restart the PBRC unit officially. They called it a 'community-led model'."

The villagers clapped. Even those who were unsure before smiled.

- The tension was not gone. The future still held questions. But the village had done something real. They had been seen.
- Tari looked out toward the reef. The sea was still rising and falling, carrying both trouble and hope.
- And for the first time, it felt like they weren’t facing it alone.

Chapter 20: The Pact

The village hadn't felt this alive in years.

- After the letter from PBRC arrived, everything changed. People who once ignored the ocean began talking about it at the market, at the mosque, and even while fixing fishing nets. The old reef platform, once forgotten, was now a symbol of something more: a second chance.
- At the next village meeting, the air was thick with energy. Everyone came: fishermen, mothers, schoolchildren, and elders. Even the district officers returned to listen, not lead.
- Tari stood in front of Budi. She held the notebook that had started it all.
- "This isn't just a machine," she said. "It's a promise. If we protect it, the reef can keep

healing. The fish will return. And our children will know what a living sea looks like."

- Pak Darto, who had once doubted her, raised his hand. "So what do you ask of us, little one?"
- "Let's work together," she said. "Let's make a pact. The reef, the PBRC machine, and the ocean are all part of our home. We need to treat it that way."
- A quiet fell over the crowd. Then Bu Sari stood up and said, "We can do that. We must."

What followed was simple, but powerful.

- Each group in the village took a role. The fishermen agreed to fish only in certain areas, leaving the reef zone alone so it could recover. Mothers organized beach cleanups every

weekend. Students kept track of plastic collected and helped log it into the PBRC system. Even the elders, some of whom could no longer walk to the shore, wrote down sea stories to pass on to the next generation.

They called it “The Pact of the Tide.”

- A large board was placed at the center of the village with the pact written on it. At the bottom were dozens of them. And more were added each day.
- The PBRC team from Jakarta later visited the village. They brought a new unit to replace the old one and offered training on how to run it. But they were careful not to take over.
- “You started this,” one engineer said. “We’re just here to support it.”

- For the first time, the village felt part of something bigger but still in control of their future.
- The reef, too, responded.

- More fish returned. Sea grasses grew thicker. Even turtles were spotted near the shallow waters. Tourists slowly began to come back, not to exploit, but to learn.
- One visitor, a young researcher, asked Tari, “How did your village manage to do all this?”
- Tari smiled and pointed to the sea. “We listened. And we remembered that the ocean gives more than it takes if we let it.”
- That night, the village held a small festival by the shore. There was no loud music or fancy

lights. Just shared food, gentle drums, and stories under the stars. Nia sat wrapped in a shawl, her eyes shining.

- “You’ve done well, little fish,” she told Tari.
- Tari looked out at the water, where the PBRC light still blinked in the distance. Steady. Alive.
- “It wasn’t just me,” she said. “It was all of us.”
- The tide had turned. Not with noise, but with hands, hearts, and a promise. The pact they made wasn’t just to protect a machine or a reef. It was a promise to protect the life that made their village what it was.
- And from that moment on, they kept it.

Chapter 21: The World Watches

Months passed. The sea kept changing, slowly but surely.

The PBRC machine now had a shelter built around it by the villagers. The kids called it “The Heart” because it kept the reef alive. Every week, students entered logs into a shared system. Plastic collected was weighed, recorded, and sent off to a recycling center. The reef had color again, and the fish came back in numbers people hadn’t seen in years.

But something else was changing too.

First, a local journalist visited the village and wrote a short article about “the kids who saved a reef.” It was posted online, and within days, it was shared across the country. People began calling it a model for ocean protection.

Then came the calls.

- One from Jakarta. Another from a marine science group in the Philippines. An email came from a teacher in Kenya who wanted her students to hear Tari's story.
- Soon, a video crew arrived to make a short documentary. They filmed the reef, the machine, the school, and the meetings under the banyan tree. They followed Tari and Budi on their canoe to the platform. Nia, sitting proudly on the porch, told stories of what the ocean once was.
- "We forgot for a while," she said into the camera. "But the sea didn't."
- After the film was released, things moved faster. A youth ocean summit invited Tari to speak online. A university offered Budi a

scholarship to study environmental science when he was older. A group in Australia sent the village snorkel kits and new reef sensors.

- But through it all, the village stayed grounded. The pact remained the same.
- They added one new part: “Share what you learn. Help others do the same.”
- Tari didn’t feel like a hero. She still went to school, still helped her mother with seaweed drying, and still listened to her grandmother’s stories at night. But now, her voice was reaching further than she ever imagined.
- One day, while walking by the beach, she saw new signs put up by the village council. They had pictures of fish, coral, and plastic waste, with short messages in three languages:

Protect the Reef. Collect, Not Pollute. The Sea Is Our Home.

- Tourists began visiting not with trash, but with questions.

“How does the PBRC machine work?”

“Can we help clean the beach?”

“Do you teach children about the reef?”

- ✓ Tari and Budi became guides. They showed the reef, explained the machine, and shared the story of how it all began. Not with money. Not with scientists. But with two children who saw a dying sea and didn’t walk away.

Even the government began to listen differently.

- A national marine protection program added the village to its model sites list. A small fund was approved to help maintain the PBRC system. Most important of all, the village was left in charge.
- They had proven something powerful: small places could lead to big change.
- That night, as Tari sat on the sand, she watched the blinking light from the PBRC unit out in the water. It still pulsed soft, steady, alive.
- Budi joined her, holding a new letter. It was from a girl in Fiji who read about them and wanted to start a reef project in her village.

Tari read it silently, then smiled. “Let’s write back.”

The sea had once cried out for help. Now, it echoed with voices from everywhere—voices ready to protect, to clean, to rebuild.

- Tari looked out at the water. It no longer looked tired.
- The world was watching.
- And for once, it was listening.

Chapter 22: Ocean Breathes Again

- The sea was calm, and the sky was clear. A gentle wind carried the scent of salt and seaweed as Tari stood at the edge of the shore, watching the reef in the distance. Waves rolled in, quiet and slow, as if the ocean was finally at peace.

It had been a long journey.

- Months ago, the reef had been white and lifeless. Plastic had drifted through the water like ghosts. Fish were hard to find, and people had stopped believing that the ocean could

recover. But now, the reef was glowing again. Colors had returned to soft blues, bright oranges, and gentle greens. Fish darted between coral branches, sea turtles swam slowly near the shallows, and seabirds circled above.

- The ocean was breathing again.
- And so was the village.

- Tari walked barefoot across the sand, passing a group of younger children collecting small bits of plastic. They laughed as they filled their buckets, knowing that even small pieces mattered now. Further up the beach, Budi was helping paint a new signboard showing which parts of the reef were protected and why.

At the top of the sign, in big letters, it read:

"This Reef Lives Because We Cared."

- The PBRC machine still stood out in the water, quiet but steady. Its blinking green light reminded everyone that small actions could grow into something powerful. The upgraded system now feeds data to researchers in Jakarta. It tracked how much plastic was collected, how the coral responded, and how the reef was recovering over time. But most of the work still came from the villagers themselves.
- Fishermen stuck to agreed-upon fishing zones, leaving the reef area untouched. Families sorted their waste. Tourists came not to party, but to learn to snorkel gently, ask questions, and listen.
- The village had become something more than just a coastal town. It was now a living

example of what could happen when people listened to the sea and each other.

- One evening, the community gathered under the banyan tree for a quiet celebration. No fireworks, no loud music. Just food, lanterns, and stories.

- Pak Darto, once the loudest skeptic, stood to speak. “We didn’t believe at first. But now, we see it. The reef speaks in color. The fish speak in numbers. And the sea… It’s alive again. Because of all of you.”
- Nia sat nearby, her shawl wrapped around her shoulders. She didn’t speak much anymore, but when she smiled at Tari, it said everything.

- Later that night, Tari sat alone on the beach. The stars reflected off the water like tiny floating lights. The soft sound of waves filled the silence.
- She thought about how it all began. A dying reef. A forgotten machine. A question in a classroom. And the feeling that something had to be done, even if no one believed it at first.
- Now, people from other islands were reaching out. A teacher from the Philippines. A youth group from Kenya. A researcher in Australia. They wanted to know how a small village in Sulawesi helped a reef come back to life.
- Tari didn’t feel like a hero. She was just someone who noticed something was wrong and didn’t look away.

- She reached into her pocket and pulled out a smooth white stone she had kept from the first time she saw the bleached reef. It had once reminded her of how broken things were. Now, it reminded her of how things can heal.
- The wind picked up slightly, and the waves danced under the moonlight.

A Sea Worth Saving

The ocean doesn't ask for much. Just care. Just attention. Just a little effort from many hands.

You don't have to live by the sea to protect it. You don't have to be an expert to make a difference. Start small:

- Pick up trash before it reaches the water
- Learn about marine life in your area

- Talk about ocean protection at your school or with your friends
- Support clean-up programs and responsible tourism
- Think twice before using plastic

- The sea gives us food, oxygen, and life. When we protect it, we protect ourselves
- And like Tari, you don’t need permission to start. You just need to care.