Wave-Powered Sustainable Desalination Solution:

1. Buoy Structure:

- Made from 170,000 recycled plastic bottles for environmental sustainability.
- Dimensions: 5 m x 8 m (16 ft x 26 ft), Weight: 11,000 kg.
- Equipped with a solar panel array featuring a solar tracker for optimized energy capture.
- A shutter system protects the solar panels from atmospheric agents and allows temperature regulation.
- Components use rust-resistant materials, and routine maintenance checks are scheduled for corrosion inspection.

2. Wave Energy Conversion:

- The buoy utilizes wave motion for propulsion and energy generation.
- Attached to the buoy is a hydraulic motor and alternator mechanism, serving the sole purpose of storing excess energy in batteries for later use.

3. Energy Storage:

- Excess energy generated from both wave and solar sources is stored in batteries housed securely within the buoy.
- Stored energy is utilized to provide power to locals, communities, including schools, hospitals, and residential areas.

4. Water Desalination Process:

- Offshore Desalination: The buoy integrates an all-in-one desalination system. This includes offshore pumping, filters, and reverse osmosis membranes to produce high-quality drinking water. **-**

Brine Disposal: The desalination process results in brine with slightly higher salinity than ocean water (± 30%). The brine is discharged over a broad area through the buoy's water intake and outlet, minimizing environmental impact.

5. Water Distribution:

- Desalinated water is pumped through an underwater pipeline back to the shore.

- **Pipeline Material:** Polyethylene pipes are used for their resistance to corrosion, rust, and bacteriological growth, ensuring the water quality remains high during transportation.

6. Pumping Mechanism:

- **Wave and Solar-Powered:** The pumping process is powered by both wave energy and solar panels.

- **Intelligent Control System:** Sensors powered by solar energy supervise weather conditions, climate changes, the buoy's condition, battery status, tank levels, and system efficiency. Notifications are sent to a dedicated mobile app.

7. Batteries and Energy Distribution:

- Batteries are placed in a sealed, waterproof compartment within the buoy, protected from saltwater exposure.

- **Battery Security:** Sealed and waterproof compartments with marine-grade seals and gaskets protect batteries from direct exposure to saltwater. Rust-resistant materials are used for mounting brackets, and routine maintenance checks ensure longevity.

8. Solar Panel Protection:

- **Frame Materials:** Anodized aluminum or stainless steel for corrosion resistance.

- **Mounting Hardware:** Stainless steel for durability.

- **Backsheet:** Material resistant to corrosion (to be determined) and marine-grade quality.

- **Encapsulation Materials:** Ethylene-vinyl acetate of marine-grade quality.

- **Junction Box:** Well-sealed to prevent water ingress.

Sensor Integration:

Weather Conditions' Sensors:

- Anemometer (Wind Speed Sensor):

- Determines if it's safe to open or close the roof.

- Barometer (Atmospheric Pressure Sensor):

- Rapid pressure drops might indicate an incoming storm, prompting roof closure.

- Rain Sensor

- Light Sensor:

- Manages roof opening during daylight for solar energy.

- UV Sensor:

- Measures UV radiation intensity, protecting the solar panel backsheet.

Boat's Sensors:

- Bilge Water Level Sensor:

- Indicates leaks or other issues.

- GPS Module:

- Used for navigation, route planning, and emergencies.

- Inclinometer (Tilt Sensor):

- Measures boat tilt for stability monitoring.

- Engine Health Sensors:

- Monitor engine parameters like temperature, oil pressure, and RPM.

- Depth Sounder:

- Measures water depth for navigation and grounding avoidance.

Solar Panel Monitoring:

- Current and Voltage Sensors:

- Measure solar panel output.

- Charge Controller with Monitoring:

- Regulates battery charging and provides data on current, voltage, and state of charge.

- Cloud-Based Monitoring Systems:

- Enables remote access to solar panel and battery data through a smartphone app or web portal.

Efficiency and System Health Sensors:

Evaluate the efficiency of energy conversion and water desalination processes.

Alert the Battery and Tank Sensors:

Constantly monitor battery levels, ensuring optimal energy storage for sustained power supply.

Track desalinated water levels in storage tanks to facilitate distribution planning. maintenance team to any deviations in system health, enabling proactive interventions.

Advantages and Features:

- Zero Electricity Dependency:

- The buoy operates independently without relying on external electricity, fuel, or solar panels.

- Reduces operational costs by harnessing wave and solar energy.

- Sustainable Water Desalination:

- Produces up to 13,000 gallons (53,000 liters) of fresh water per day.

- All-in-one desalination system with minimal environmental impact.

- Adaptive Energy Supply:

- Combines energy from both wave and solar sources for consistent and reliable power generation.

- Intelligent control system optimizes energy distribution based on community needs.

- Environmental Resilience:

- Materials and design prioritize corrosion resistance and durability in marine environments.

- Sealed compartments and routine maintenance ensure long-term functionality.

Impact on Sustainable Development Goals (SDGs):

1. SDG 6: Clean Water and Sanitation:

- Provides a sustainable and reliable source of clean water through innovative desalination methods.

2. SDG 7: Affordable and Clean Energy:

- Harnesses renewable energy from waves and solar panels, contributing to affordable and clean energy solutions.

3. SDG 9: Industry, Innovation, and Infrastructure:

- Demonstrates innovative infrastructure for sustainable water and energy solutions.

4. SDG 11: Sustainable Cities and Communities:

- Improves living conditions by providing consistent power and access to clean water, supporting the development of sustainable communities.

5. SDG 14: Life Below Water:

- Mitigates environmental impact through eco-friendly brine disposal and artificial reef creation, preserving marine ecosystems.

Impact on Daily Lives, Environment, and Economy:

- Daily Lives:

- Consistent access to clean water and electricity transforms daily living conditions for individuals and communities.
- Empowers schools, hospitals, and residential areas with uninterrupted power supply and clean water.

- Environment:

- Minimizes environmental impact through sustainable brine disposal and artificial reef formation.
- Protects solar panels and buoy components from corrosion and wear, extending their lifespan.

- Economy:

- Provides economic relief by reducing water costs compared to conventional desalination methods.
- Creates opportunities for local maintenance jobs, as the buoys are designed for limited and straightforward maintenance.

- Community Empowerment:

- Enables local communities to become self-sufficient in water and energy supply, reducing dependency on external sources.
- Schools and hospitals benefit from consistent energy, improving educational and healthcare services.

- Mitigation of Inequalities:

- Addresses social and economic inequalities by ensuring that both affluent and marginalized communities have access to essential services.

- Technological Innovation:

- Represents a leap in technological innovation, combining wave and solar energy for comprehensive solutions to water and power challenges.

Floating Trash Skimmer Add-On

To further enhance the ecological impact of the Wave-Powered Sustainable Desalination Solution by Wimbi, we propose the integration of a Floating Trash Skimmer. This add-on will play a pivotal role in combating plastic pollution and improving the overall health of marine ecosystems. Here's how the extension integrates into the existing solution:

Mechanism and Operation:

- Pump System:

- A dedicated pump system within the buoy is designed to intake water along with debris.
- The pump propels the water through a filtration process, separating trash from water.

- Trash Collection:

- The debris and trash are collected in a robust catch bag within the buoy.
- The catch bag is easily accessible for periodic emptying.

- Clean Water Release:

- After filtration, the clean water is released back into the ocean, ensuring minimal environmental impact.

Features and Capabilities:

- Adaptability:

- The Floating Trash Skimmer is adaptable to various marine environments, including both coastal and offshore locations.

- Continuous Operation:

- The skimmer can operate continuously, contributing to ongoing pollution prevention.

- Capacity:

- The catch bag's capacity is optimized to hold a significant amount of marine debris, approximately 44 pounds (20 kilograms).

Advantages:

- **Holistic Environmental Solution:**
- Addresses both water scarcity and plastic pollution, aligning with Sustainable Development Goals related to clean water (SDG 6) and life below water (SDG 14).

- **Community Awareness:**
- Raises awareness about plastic pollution and actively involves local communities in environmental conservation.

- **Low Maintenance:**
- Incorporates a low-maintenance design, ensuring optimal operation without excessive upkeep.

Integration:

- **Seamless Addition:**
- The Floating Trash Skimmer is seamlessly integrated into the existing buoy structure without compromising its primary functions.

- **Smart Operation:**
- The skimmer operates intelligently, complementing the buoy's smart control system, and is powered by the same renewable energy sources.

Conclusion:

The Wave-Powered Sustainable Desalination Solution by Wimbi stands at the forefront of innovative, eco-friendly initiatives, seamlessly addressing pressing challenges while championing sustainability and community well-being.

This integrated system is a beacon of hope for regions grappling with water and power shortages. Its unique utilization of wave and solar energy ensures a continuous, clean water supply and electricity, meeting the immediate needs of communities. The incorporation of smart technologies and environmental sensors guarantees efficient and responsible operation, contributing to the preservation of marine ecosystems.

Beyond the basics, Wimbi's solution becomes a catalyst for economic growth, reduction of inequalities, and technological advancement. It represents a holistic approach to sustainable development, intertwining renewable energy, water desalination, and intelligent systems to uplift communities facing the complex interplay of water and power scarcity.

The addition of the Floating Trash Skimmer extension elevates Wimbi's impact to an even greater magnitude. By actively participating in marine conservation and combating plastic pollution, the solution not only provides essential resources but becomes a guardian of our oceans. Wimbi, with its comprehensive approach, emerges as a symbol of responsible innovation, fostering resilient communities and a healthier planet.