



Ministry of Marine Resources  
GOVERNMENT OF THE COOK ISLANDS  
TU'ANGA O TE PAE MOANA

# Study reviews environ



Aerial view of Aroko, Muri Lagoon, showing seaweed growth near Motutapu. PHOTO: Kirby Morejohn

A NEW scientific assessment has been completed for the Ministry of Marine Resources (MMR) on Muri Lagoon's health and environmental status.

An interdisciplinary team of consultants from AECOM International Development Europe, a multinational engineering firm, have supported MMR's ongoing efforts to assess the environmental condition of Muri Lagoon.

In March 2017, Government launched an interdisciplinary assessment of Muri Lagoon (IAML) to help improve knowledge relating to water quality, ecological health, seaweed growth and public health conditions within the lagoon.

The study, funded by the European Commission under the European Development Fund 2014-20 (EDF), has now been completed and the findings are presented in a final report. The objectives of the study were closely integrated with those of the Cook Islands National Sustainable Development Plan (NSDP) Te Kaveinga Nui 2016-2020 and in particular indicator 12.4, which relates to monitoring the health of the lagoon.

MMR Secretary Ben Ponia says that it is well recognised now that a holistic approach is required to put together the jigsaw of factors affecting the health of Muri Lagoon.

"Although the Ministry has data in Muri going back twenty years, a lot of effort in the past has been focussed on collecting data and less on ana-

lysing the broader picture and trends," he says.

The primary areas of focus for the study were a comprehensive review on the lagoon water quality; public health safety concerns; a review on the biodiversity status and health of the marine ecosystem; providing options and recommendations for improvement and mitigation; and specific tasks to raise public awareness on the conservation of Muri Lagoon. Key findings relate to the possible environmental conditions that may lead to seaweed outbreaks and when the risk of outbreak is greatest.

AECOM Team Leader, Jonathan McCue, says the physical conditions in Muri Lagoon are more prone to seaweed outbreaks from December to February and appear to coincide with warmer water temperature, high rainfall and lower salinity (quantity of dissolved salt in water) levels.

"During these months, records suggest that the lagoon has lower than average salinity levels (31.6%) in the inner lagoon, possibly influenced by higher rainfall levels. Higher sea water temperature (29.5°C), has also been recorded during this time which combined may "trigger" growth of seaweeds compared to when sea temperatures are 1°C cooler. We also note increased stream and lagoon nutrient levels during the months of highest rainfall. There may be a correlation between the level of nutrients from streams (one of the main causes for the seaweed to proliferate) and

reduced salinity. This is key, as seaweed species occurring in Muri Lagoon are thought to be sensitive to extreme salinity levels," says McCue.

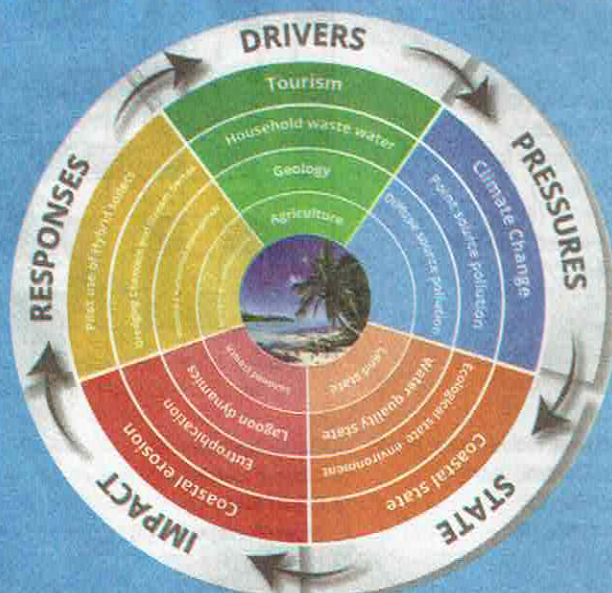
Based on the available data, the level of nutrients in Muri Lagoon is higher than acceptable water quality standards. Other indicators such as water clarity (which is monitored measuring total suspended solids and chlorophyll-a) also have recorded levels as being slightly above acceptable standards. "Despite some water quality parameters not meeting the national standards, it is important to note that the lagoon remains safe for recreational activities and the World Health Organisation (2000) guidelines for swimming quality," stresses AECOM Team Environmental Statistician, Hakan Demirbukan.

Water quality monitoring performed by MMR report that bacterial levels are recorded at acceptable levels for all test sites (apart from a few sporadic "spike" readings), complying with national and international water quality standards.

McCue says the major wastewater upgrade plans being developed by the Mei Te Vai Ki Te Vai project will have a positive contribution towards the improvement of the environmental status of Muri Lagoon. "But this is not the "silver bullet", other complementary actions need to be considered and adopted to improve general water quality as well as broader ecosystem health interventions, including specific stream water treatment

## MURI LAGOON

Changing its appearance through societal and environment interactions



Right: A draft of a Lagoon Health Report Card to be produced by MMR. On the left Muri Lagoon has been divided into "management zones" to help better understand specific issues to help determine appropriate short-term intervention options.

**2018 Muri Lagoon Health Report Card**

The report card includes a map of the lagoon divided into management zones (North, South, East, West) and a table of performance indicators. A large red stamp reads "DRAFT REPORT (not real data)".

Indicator	Target	2018 Status
Water Quality	Good	Good
Public Health	Good	Good
Biodiversity	Good	Good

**2018 Muri Lagoon Health Index Breakdown**

**Evolution of the Muri Lagoon Health Index**

Line graph showing the health index from 2012 to 2018. The index fluctuates between 'Good' and 'Fair' levels.



# Environmental state of Muri Lagoon



MMR Fisheries Officers survey Rarotonga's lagoons.



Underwater image of a group of goatfish and surgeonfish (among others) grazing on seaweed covering substrate within the Matavera area. PHOTO: Lara Ainley



Underwater image of surgeonfish (among others) grazing on seaweed covering substrate within Muri Lagoon near Aroko. PHOTO: Lara Ainley

works, development of road drainage systems and mechanisms to improve lagoon flushing.”

A set of recommendations related to improving water quality and environmental monitoring have been proposed, including a Lagoon Health Report Card that can be designed to provide a summary of the health of a specific island, part of an island or specific lagoon area such as Muri Lagoon. AECOM Communications Manager, Lluís Torrent, says the report cards can range in number and focus on specific aspects of the environment. “They can be edited and designed to enable a reader to quickly understand the status of a lagoon, important species they may find there, or the health of the environment.”

Since 2004, MMR has conducted marine and stream water quality tests monthly and fortnightly in Rarotonga, Aitutaki and Manihiki. Test samples are processed in MMR's laboratory facilities and the results are delivered to key stakeholders. MMR is currently working to apply a new Lagoon Health Report Card to its current water quality reporting format to improve the distribution and understanding of the information presented. The new Water Quality Health Report Card sets a new scoring system that describes the status (the condition of an indicator) and trend (change in status through time) of each indicator which measures water quality.

MMR Senior Marine Ecologist Dr Lara Ainley says the delivery of the assessment findings is timely and relates directly to the on-going efforts of MMR to improve and expand its environmental monitoring programmes. “The goals of such

efforts are to enhance our long term datasets and provide more comprehensive insights into how ecosystems change over time. Ultimately, this will mean we are equipped with a better understanding of the environment and are able to make more informed management decisions if and when required. With the specific focus on Muri, the consultants worked closely with the Mei Te Vai Ki Te Vai (MTVKTV) project ensuring coordination across multi-institutional projects. The results of this report will also feed directly into the outcomes of the MTVKTV project.”

In January 2017, the Cook Islands Government launched the Mei Te Vai Ki Te Vai (MTVKTV) project to improve the water quality of the lagoons in Rarotonga and Aitutaki. The project includes an environmental monitoring and investigation programme that will build on existing studies, including this new MMR study. MTVKTV's investigations will provide a methodology for water quality assessment, monitoring and management in other parts Rarotonga and the Cook Islands. MTVKTV is also identifying early mitigation measures to address water quality issues in the short-term (including dredging), and designing infrastructure for improved wastewater management in the long-term.

MMR continues to develop its water quality monitoring programme to provide information on the changing conditions of the lagoon.

### IAML Project information

The final report will be made available via the MMR website [ww.mmr.gov.ck/publications/documents](http://ww.mmr.gov.ck/publications/documents)



Underwater image showing the seaweed *Caulerpa racemosa* growing on top of coral reef near Papaaroa. PHOTO: Kirby Morejohn



Boodlea sp. seaweed growing on the lagoon floor. IMAGE: Kirby Morejohn



Pearl Support & Laboratory Services Division Senior Fisheries Officer Teina Tuatai in the MMR Chemistry lab.



A group of college students recently learned more about the lagoon ecosystem with MMR Marine Scientist James Kora as part of raising awareness about conserving the health of our lagoons.



Environmental factsheets for stakeholders were produced during the study to raise awareness about the health of Muri Lagoon, present most recent findings on the pressures and effects on the lagoon, and introduce work being done to preserve its health.

