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Determination of nutrient offloads (rev.)

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Summary:

The paper reiterates support by the RSTC on future studies focusing on estimating nutrient concentrations and BOD of human and animal faeces and urine, and the efficacy of differentwaste treatment systems. It also supports the recommendation that future research improve estimatedloads for waste pollution with more applied research on nutrient contents of human and animal wastes closer to point source of pollution in tropical areas of the Pacific region. The paper recommends several options to progressing the determination of nutrient offloads, which include support for future R2R investments directed into research and development (and PG, Master & PhD scholarships) that undertake research to establish standards and nutrient contents in Pacific Island countries and the whole region.

Recommendations:

The R2R Technical Consultation is invited to:-

(i) Consider and discuss the suggested options to progress improving the quality, relevance and accuracy of standards used to measure change in stress reduction targets; and

(ii) Discuss and agree on preferred options to progress further as set out in the paper possibly to inform future directions post current IW R2R project.

Revised National Results LogFrame& Milestone Targets

Introduction

1. The latest specific milestone targets and outputs follow a process of close consultation with countries to review their targets agreed many years passed in light of changing priorities and available resources. Following the RSTC/ RSC meetings last year, the RPCU resumed work assisting countries review their national logframes and MYCWPs. A brief planning schedule of successive events and timelines and several country visits by RPCU staffs guided progress of the review. This was an important undertaking for a no cost extension, recently approved by GEF.

2. Over the years, there have been several changes in the implementation of the R2R program and its child projects. This includes the changes to the original setting of national targets, and priorities have also shifted on management approaches (e.g. stress reduction, catchment protection, habitats). The IW R2R project mid-term review also recommended for the revision of national LogFrames which include milestone targets.

3. The RPCU-SPC collaborated with project countries to explore research possibilities and investigations on nutrient content from piggeries at several sites so that there are datasets specific to countries like Kiribati where water scarcity is a recurring issue.The milestone targets were updated in consultation with IW R2R demonstration projects, in particular for the waste treatment systems or piggeries. There was limited data available in the literature on nutrient contents of different countries in this region. As a result of these consultations, Nauru has dropped the activity on the constructed wetlands system and, Niue will no longer progressing work on the renovation of septic systems. This has been taken up by a GIZ and Australia Aid project in the country.

4. The Committee reviewed and endorsed the methodology and formula that uses two metrics to calculate estimated levels of land area and pollution levels, in order to review project countries' milestone targets. There are at least two metrics used for milestone targets. The first metric measures or calculates the area of the demonstration site or the boundary of catchment sites, which wasestimatedby the countries or by the SPC R2R Regional Program Coordination Unit (RPCU) using QGIS software. The second metric measures reduction in nutrients through a water source waste treatment system and/or dry litter piggery system.

5. The brief paper provides an update of the national demonstrations relative to their national milestone targets, and identifies options to improve quality, relevance and accuracy of standards used to measure trends in targets such as measuring nutrient loads.

Key Issues

6. There are issues associated with the calculation and making qualitatively estimates of national milestone targets on stress reduction for project countries. At the RSTC meeting last year, concerns were raised on the assumptions and risks associated with the use of best available standards in the calculation of milestone targets, such as nutrients loads. The standards from abroad were used to estimate nutrients loads because there was limited data available in the literature on nutrient contents of different countries in the Pacific region. For instance, the formula to estimate levels of certain pollutants in piggery wastes and urine data standard for piggeries based on Australian and American Commercial piggeries, where circumstances are not the same as in the tropics and in this region.

7. There were also concerns on assumptions when trying to understand the determination of estimated milestone targets. The Committee noted the critical importance of this and the need to be clear about the assumptions, risks and uncertainties when using the methodology for estimating area of demonstration site, and nutrient offloads. These concerns need addressing in order to generate realistic parameters and standards, which in turn, help to understand how the targets were derived. The assumptions may cover economic, political and social parameters likely to influence or impact on the estimation of milestone targets such as reduction in nutrients offload.

8. The Committee also recognized the importance of accurately measuring environmental stress reduction despite the practical challenges commonly encountered in the field. Therefore, the Committee considered it critically important to recognise uncertainties especially collecting baseline data and information over extended period of time, if the aim is to allow targets to be realistically compared with the actual outcome. Equally important is the need to identify and understand the underlying assumptions and risks, and the consequences if such are not met. This is particularly important if the results show significant changes to indicators being measured and thereby achieving (or not) the milestone targets.

Current Method & Process for Calculation National Stress Reduction Targets

9. The area for Catchment Protection Measures/ Restored Habitat/ Protected Fish Refugia Habitat is estimated by defining the boundaries of project sites and calculating the area using QGIS software. In contrast estimate loads for Municipal Wastewater Pollution Reduction / Pollution Reduction to Aquifers would include getting information on updated activities;number of households served through the various wastewater treatment approaches; andnumber of piggeries and pigs served through the dry-litter piggery technology.

10. The equations were put together to calculate an estimate for the anticipated pollutant load reductions via the installation of compost toilet systems, on-site wastewater treatment system upgrades and dry litter technology for pig waste management. Equally, the literature was consulted in search of information on nutrient content of human faeces and urine and the efficacy of different waste treatment systems to generate average values for both. Several published papers contain data on nutrient content of human waste. The data chosen represent a range of locations yet presented with the same units of measurement. Key points from the papers:-

(i) Nutrient concentrations and BOD are higher in the global north than south, and average mass is higher in global south than north. This trend correlates with the amount of nutrients and fibre in local diets.

(ii) Estimates of efficiency of different on-site waste treatment systems to remove nitrogen from the waste stream were found in the literature and used as coefficients.

11. Data for the nutrient content of pig waste was derived from the American Society of Agriculture. The figures do not take in to consideration the different nutrient content and volume of waste from pigs that are raised in water-scarce environments and whose diet is significantly different from commercially raised American swine. There were no figures for nutrient content of pig waste in the Pacific.

12. These figures were used in simple equations that take the population and number of households, along with average nutrient content of daily waste and estimate the reduction of nutrients through the current systems, and anticipated reductions of nutrients through the proposed systems.

$$(nHH \times npHH \times avgN) \times 365 \times e = annual\ load\ per\ site$$

$$HH = households$$
$$pHH = person/household$$
$$avgN = average\ nutrient\ content\ of\ waste\ per\ person\ per\ day$$
$$e = efficiencyoftreatmentsystem$$

Suggested Approach

13 The Committee encouraged moving away from using external standards that do~~n't~~ not relate to the tropics and, consider carrying out research that would generate such standards closer to the point source of discharge. There was also agreement to establishstandards and nutrient levels that are relevant to this region, and can be used in future calculation of estimates on the reduction of nutrient loads to aquifers and receiving environments.

14. Generally the paper encourages investments into research and development in establishing nutrient contents on human and animal wastes for Pacific Island countries. The results would be used to establish practical standards for the Pacific region. Suggested options below:-

(i) Consult widely and seek interest from research institutions to explore several possibilities through identifying research topics relevant to determining nutrient offloads in Pacific island countries;

(ii) Guideline on land-use (i.e. agricultural, remote, rural, peri-urban, urban and industrial) will be useful in relating the outcomes of water quality assessment to the surrounding due to the difficult to identify point-sources as there are no defined boundaries or a lack of them;

(iii) In addition, water quality monitoring protocol that assess long term water quality changes should include microplastics and antibiotics apart from the conventional parameters such as presence pesticide, nutrients mainly ammonia, nitrates, nitrites, phosphate;

(iv) The need to include chemical or biological profile data in water quality assessment in addition to information on concentration data;

(v) Similarly, the commercial farms of animals can be approached seeking their interests;

(vi) Prepare a concept for a regional/ sub-regional program for GEF funding specific to support research efforts to determine nutrient contents on human and animal wastes in Pacific island countries. The concept should clearly outline details on participating agencies and countries and their roles, as well, milestone targets and the benefits responding to national and regional priorities but also useful to meeting global targets;

(vii) Build into future R2R regional programs scholarships specifically tailored made to addressing several topics in the area of determining standards for nutrient offloads from human and animal wastes in this region useful to measure and track changes in various indicators and therefore milestone targets; and

(viii) Support and continue efforts under the James Cook University training course to include applied topics as major projects or research topics for students and also, how it can be adapted to the curriculum needs of other Pacific national and regional universities.

15. Generally participatory strategic planning exercises may be required to ensure that the approach is thoroughly discussed and agreed on best-preferred options. Seminars and discussion groups can be organised to raise awareness of the issues, identifyrelevant research topics, and discuss other relevant considerations support moving forward.

Conclusion:

16. The revised environmental stress reduction targets of the Regional IW R2R project are dominantly adjusted down than initial targets. Similarly, the boundary of demonstration sites appeared to be largely adjusted lower than initial large sizes of sites. The RSTC underlines the importance of sharing this information with STAR R2R Projects for their inputs and updates for reporting under the GEF Pacific Regional R2R Programme Framework Document. This paper further supports that revised targets and methodology used to estimate size of a site is based on two metrics are also shared with STAR R2R projects.

17. The paper recognised RSTC supports future studies focusing on estimating nutrient concentrations and BOD of human and animal faeces and urine, and the efficacy of differentwaste treatment systems. It also supports the recommendation that future research improve estimatedloads for waste pollution with more applied research on nutrient contents of human and animal wastes closer to point source of pollution in tropical areas of the Pacific region.