TEMIS IMPROVEMENT PLAN AND RECOMMENDATIONS

Regional EMIS Technical Support Facility, SPC

UNESCO Institute for Statistics, Pacific Office

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VERSION 3

CONTENTS

ABBREVIATIONS

EMIS	Education Management Information System
DQAF	Data Quality Assessment Framework
ICT	Information and Communication Technology
IT	Information Technology
MIS	Management Information System
MoE	Ministry of Education
PD	Professional Development
SIS	School Information System
SQL	Structured Query Language

Introduction

"By December 2017 improvements are made to TEMIS including human resources, technology and business processes so that the system produces accurate and timely information that managers can use for decision-making."

An Education Management Information System (EMIS) should be able to provide good quality information, in a timely manner to assist education managers at the national, regional and school levels to make good planning decisions and to know whether implementation of plans are achieving the expected results. The Tuvalu Education Management Information System (TEMIS) does not yet provide such information in a form that is easily used by decision-makers but does have a good chance to do so in the short term future given the system is now available to users within MEYS (local server) its relative ease of use and also due to the availability of time series data since 2012.

The Ministry of Education Youth and Sports (MEYS) recognises this problem, and the TESP III states that *"*The 2017 DQAF states that a SIEMIS Improvement Plan be developed.

1. Overview of Recommendation: Proposed TEMIS improvement for MEYS

The overall recommendation here is that the TEMIS Software be enhanced and upgraded, greater human resources employed within the Ministry to assist with the collection, processing, verification and analysis of education data and other resources where needed locally.

It is proposed that the TEMIS system will be being stored in a central server in the Ministry ICT Unit. TEMIS improvement will be focused on three main areas.

- Data Access/Visibility
- Data Quality/Collection
- Data Integration

The development of a Ministry wide interface will serve up education management information for a range of stakeholders including staff and managers in MEYS. This information includes information on school attendance (teachers and pupils), textbook inventories, personnel development, infrastructure, buildings and equipment and key education indicators. A component of the EMIS project will provide capacity building to the TEMIS officers so that they acquire the expertise to adjust and extend the system,

1.1. TEMIS

The TEMIS data management system is in use in MEYS for the entry and analysis of education data.

However, the system is underutilized in several ways:

- Data accessibility: Up until recently accessibility to TEMIS was limited to one or two users within MEYS who had access to a local version of the TEMIS database. Changes to the system could not be made concurrently and therefore resulting in redundancy.
- Some features relevant to MEYS in TEMIS are simply not used. For example the School Student Attendance module is not used. Student Assessment data was piloted in 2012 but has not featured since. The text books and professional development modules appear to contain almost no data. However, even if they were used they would not meet the specific requirements of MEYS. The poor usability of the system is one explanation for this; another is the lack of correspondence between the data structures used in TEMIS and the relevant processes followed in MEYS.
- *The system does not enable all the key education indicators to be readily generated yet.*
  Most of the widely used indicators such as net and gross enrolment ratios, retention and survival rates, and so on can easily be generated directly from the system. In addition many standard simple reports on the Tuvalu Education system can also be generated, but they are mostly in the form of frequency tables and cross tabulations. In order to generate many of the new SDG Agenda Goal 4 relevant education indicators, for example, the data would need to be exported to spreadsheets and then processed. Alternatively, Structured Query Language (SQL) can be used to generate ad hoc reports. The system should be able to generate reports without the user having to write SQL code.
- The reporting interface is often very inconsistent and in some cases incomplete.
  Attempts to generate many reports lead to highly technical error messages that are meaningless to the end user.
- School-based data entry is supported in TEMIS, but school management features are rudimentary and not very useful. TEMIS supports school-based data entry however no schools currently use. However, even for those schools who may wish to enter their own data, the system provides very little motivation for them to do so. There are very few features that are useful specifically to the school.

1.2. Issues in data collection and processing

Tuvalu suffers from problems with data collection that can be found in many countries where data is collected from schools on paper based forms and then entered centrally into a data system. Similar problems could be found recently in the Pacific Region, for example. In such systems, the schools' impression is that there is no real gain to the school from entering that data; it merely goes to central office and they get little return on their efforts. Lateness of submitted data from the schools is a significant problem in Tuvalu. The situation makes timely analysis of data during the school year difficult.

Countries using such systems often attempt to persuade the schools to enter their data in a timely fashion through the threat of punitive action against the offending schools, which is clearly not working effectively. An alternative approach is to make it worthwhile to the school to enter its data by providing a school level interface to the EMIS that makes it possible for the school to use its own data to support the management of the school. Attendance reports, student report cards, school report card and so on are just some of the 'feedback' features that will motivate the school to enter their data themselves. There is potential for the concept of a School Records Management System being piloted in a Funafuti Primary and Secondary School in 2017. As discussed later, when a computerized EMIS of this type is used tools to support the rapid analysis of issues to do with non-provision of data can be built in to the system; if the schools are aware that they are being effectively monitored they are more likely to enter the data correctly and on time.

1.3. ICT connectivity advances

The use of email or internet in schools to supply data to MEYS using a system in which schools enter the data either in Excel or alternatively via the web and have their own school level interface to the EMIS is not currently viable. Arguments against this are raised in terms of lack of internet access for the schools, in particular those schools in the outer islands and atolls. Advances in ICT connectivity are needed before this option is pursued. Lack of fully universal school internet coverage for Tuvalu there are likely to be always a small number of schools who are unable, at a given time, to enter their data online. For such schools data will continue to be entered by MoE. However, the EMIS will allow the MoE to generate the school level reports for the schools in question. Such reports can then be provided by MoE to those schools.

When ICT connectivity to the outer islands improves, of course, there will be a significant training need, both in terms of basic computer skills and in the use of the a School Information System or EMIS itself. A nationwide scheme for training the schools is part of this EMIS project recommendation in due course.

1.4. Increasing the Reliability and Timeliness of School-submitted data

As discussed above, there are problems in the school-submitted data in Tuvalu. Here we consider arguments to support the assertion that having a School Information System that can support the monitoring of school submission of data and lead to improvements in data quality and timeliness. A school records based information system (SIMS) - EMIS can feature tools and reports to support monitoring of the data as it is being entered. Such reports indicate where there is an apparent anomaly in the data (for example, a sudden rise in enrolments in a new school year). Of course, the apparent anomaly does not necessarily represent a problem; however the report does provide the monitoring officer with the necessary information so that the situation can be checked.

To take another example EMIS, the Fiji Education Management Information System (FEMIS) has several features that help in monitoring the data submissions by schools, among them being:

- A report showing which schools, up to the time the report is generated, have yet to set up classes or student records, are not recording student attendance and have not filled in various sections of the school information (infrastructure, equipment, e.t.c)

- A report showing enrolments per class/grade in each school
- A report that shows duplicate student records (within classes and between schools)
- A report showing issues with teacher lists in each school. FEMIS links to the Fiji Education Staff Appointments (FESA) system, so a school can always tell if they have teaching staff in the school who have actually moved from the school, or teachers who should be in the list but are not. Schools report such cases to the district through FEMIS. The district office can generate the current list of such issues, which can then be fixed on FESA appropriately at that level.

All reports such as the above can be generated by TEMIS and accessed by Ministry staff but it is important that the school receives this type of information and are aware of any issues in timeliness, and accuracy of data. In addition it is important for the Ministry to use these reports to indicate where interventions are necessary.

Monitoring of data submitted by schools is also addressed in the suggested role a statistics officer in MEYS as part of TESP 3 with respect to the EMIS (Appendix A).

1.5. Ownership of System and Open Source Technologies

The recommendation here is for TEMIS should be developed using open source approaches. It must be stated clearly at the outset that because a system is developed using open source technologies it does not mean the system itself is open source. Essential system security can be implemented successfully using open source technologies. Open source technologies are suggested here because they are free to the developers and increasingly well supported, especially by online develop communities and forums. SPC recommends that the source code eventually be stored in a GitHub repository thereby obviating the need for an expensive development project involving an outside agency, in which ownership of the source code for the system resides with that agency (consider the situation in the past with Tuvalu Pineapples earlier in 2007-2011).SPC can provide a discussion document of the advantages and disadvantages of the approach.

1.6. School Information System Software in Schools

The Cook Islands Ministry of Education uses a School Records Based Management System known as MUSAC Edge based on a New Zealand software and in the Marshall Islands the main High School uses an American software package known as *PowerSchool*. These examples provide a range of school management functions for the school including student records management, class management, and timetabling and student report card generation. The system is more suitable for large primary or secondary schools. It would be worthwhile to pilot the use of a SIMS in Tuvalu in Funafuti for 2017 for example in either the large primary (Nauti) primary school or in the Secondary School (Fetuvalu).   School Information Systems provide more functionality in some respects than is envisaged so it would be better if the functionality is streamlined to including simply student enrolment and teacher data in addition to school attendance initially (cut down version). SIS systems do not support the generation of indicators at a central level that is required by MoE. However this option is a relatively expensive solution, with licensing being arranged on a per student basis (around $5 per student) and yearly maintenance payments being necessary. However it would be worth piloting this approach to see if it can provide improvements in data quality.

2. Issues for the TEMIS Project

This section summarises various key issues for the recommended EMIS project, in some cases it emphasises points that are made within the discussion in the preceding sections.

- Management of the EMIS project should be through a team not one person or project in MEYS
  - Currently MEYS does not have the expertise required to properly manage TEMIS- it seems that ICT and data management experts are focused on other work (such as ICT for better education), 3 staff are planned for recruitment in late 2017
  - there is no follow-on support for EMIS currently in MEYS for TEMIS but the new TESP 3 project provides an ideal mechanism to manage and advise the EMIS project and continue beyond it with capacity building and strategy and sustainability planning.
- Internet access and training
  - internet coverage for the whole of Tuvalu schools is still unreliable
  - many schools (especially in the outer islands) have no staff who can even use a computer adequately
    - this suggests basic IT skills training is also required for some schools
    - training in the importance of data and EMIS use will be nationwide
- MEYS facilities and staff are mostly suitable for the TEMIS
  - ICT staff have the capacity to set up the servers (complete)
  - ICT may be able to lead the IT and EMIS training
  - ICT currently do not have the capacity for actually doing the software development but are willing to be capacitated by SPC project to be part of a cohort of Pacific ICT/Software Developers and take over at a later stage, which would be done through mentoring by the SPC EMIS software developers and other colleagues from around the region (south – south collaboration)
- The resulting EMIS and all the source code for the software will be solely owned by the MEYS, Tuvalu and dependence on outside agencies will not be needed for the following:
  - making changes to system in response to emerging needs or other issues
  - minor improving and augmenting the system in the future

3. Data Quality Assessment Recommendations

The proposed list of activities aim to improve the quality of education statistics in Tuvalu by strengthening the institutional and policy environment, the organisation and statistical processes, and the technical and human resource capacity.

Institutional and policy environment
1. Develop an EMIS policy that mandates the collection and scope of education data and publication of statistics
2. Develop an ICT policy on data confidentiality, protection and security for the education sector
3. Hold regular consultation meetings with multi-sector data users to ensure relevance of education statistics to national needs
4. Establish a national education statistics taskforce to develop and implement a data quality improvement plan

Organisational and statistical processes:
5. Expand data collection to include post-school TVET (TMTI, Typing schools, etc) and tertiary education providers (USP)
6. Develop a standardized enrolment form for schools to officially record enrolment that can be completed and stored electronically
7. Document procedures for data validation/verification of student & teacher data
8. Integrate data from MEYS units on schools, teachers, students, finance and assessment into TEMIS database
9. Establish mechanisms for data integration and sharing amongst government ministries and agency, public and private institutions
10. Publish final data tables in Excel on a national website to improve data dissemination
11. Prepare a sector-wide statistical report to include TVET and Tertiary Education
12. Develop school and institution profiles for each island to improve decision-making at the community level
13. Develop a formal process for dealing with data requests, including keeping a record of data disseminated to key stakeholders

Technical and human resource capacity
14. Train TEMIS staff on designing and developing queries to respond to specific data requests
15. Improve TEMIS officers' data analysis and report writing skills
16. Train MEYS senior staff on the use of data for policy monitoring
17. Ensure ICT and statistical support is provided under a qualified EMIS data management.

4. Proposed Activities

Institutional and policy environment

Activity 1 WP 3.1c(i)-5	Develop an EMIS policy that mandates the collection and scope of education data and confidentiality of statistics (Rec 1 & 2)	Priority	3
		Cost	Nil
Description: Based on legal and regulatory mandates, draft an EMIS policy that specifies the responsibilities for data collection within the education sector and the scope of the data collection and data published in official reports. The policy should also include policies on data confidentiality, protection and security for education sector.			
EMIS Unit role	The TEMIS unit should prepare a draft of the EMIS policy in conjunction with the education statistics taskforce.		
Target group	Education data providers and users, include schools and education institutions and key education stakeholders		
Output	An approved EMIS policy published on MEYS website.		

Activity 2 WP 3.1c(i)-1	Establish a TEMIS change management process to develop and implement a data quality improvement plan (Rec 4)	Priority	3
		Cost	Nil
Description: A change management process for TEMIS needs to be drafted and approved by MEYS. The process should provide for the development and implementation of the data quality improvement plan, including monitoring and reporting on progress to PS MEYS.			
EMIS Unit role	The TEMIS unit should draft the change management processs and coordinate the meetings, prepare minutes and documents.		
Target group	TEMIS ICT Unit		
Output	Change management process established with approved TORS		

Activity 3 WP 3.1c(i)-4	Hold regular consultation meetings with multi-sector data users to ensure relevance of education statistics to national needs (Rec 3)	Priority	0
		Cost	Nil
Description: An annual meeting of key education stakeholders should be convened by the taskforce to consult on the data needs of the sector. The meeting should consider the data requirements at national, regional and international levels. Data collection activities should be proposed to ensure that the data needs are able to be met within agreed budget and timelines.			
EMIS Unit role	Coordination of consultation meeting		
Target group	Key education stakeholders, including ECCE, School, TVET and USP		
Output	Minutes of meeting with list of data needs		

Organisational and statistical processes

Activity 4 WP 3.1c(i)-1	Expand data collection to include post-school TVET and tertiary education providers (Rec 5)	Priority	1
		Cost	Nil
Description: MEYS needs to plan for a sector-wide collection of education statistics, incorporating data from TVET and tertiary education providers, especially from TMTI and computer training schools as well as from USP. Data collection instruments need to be developed and employed in the post-school sector and data incorporated into the TEMIS database.			
EMIS Unit role	Prepare data collection instruments for TVET and tertiary education sector		
Target group	TMTI, Computer Schools and USP		
Output	Approved and implemented data collection instruments for TVET and tertiary education sector		

Activity 5	Develop a standardized enrolment form for schools to officially record enrolment that can be completed and stored electronically (Rec 6)	Priority	0
		Cost	Nil
Description: Currently schools develop their own individual forms for registering student enrolments. As the TEMIS student form has now been standardised, it can be used as an official enrolment record. The TEMIS student form should be reviewed by MEYS and adopted as the official record of a student's enrolment at school. The form should be incorporated into the school administration manual and used for maintaining the School Information Management System (SIM).			
EMIS Unit role	Coordinate review of TEMIS student data collection form		
Target group	Key education stakeholders (MEYS, schools)		
Output	TEMIS data collection form adopted as official enrolment form.		

Activity 6 WP 3.1c(i)-4	Document procedures for data processing of student & teacher data (Rec 7)	Priority	1
		Cost	Nil
Description: The Tuvalu Census Procedures Manual has been drafted but not yet published. There is a need to incorporate specific data validation and verification processes in the manual for both student and teacher data. Business rules for validating and verifying the data need to be developed, tested and employed.			
EMIS Unit role	Develop and document data validation and verification processes.		
Target group	EMIS staff in TEMIS unit		
Output	Data validation and verification processes included into census procedures manual		

Activity 7 WP 3.1c(i)-2	Develop a School Information System to improve data collection at school level	Priority	2
		Cost	USD 3500
Description: Trial a school centric School Information Management System on pilot schools to improve data collection, and report on recommendations for the pilot schools and way forward for remaining schools.			
EMIS Unit role	Select schools for pilot and SIMS software		
Target group	Pilot schools for SIMS deployment		
Output	SIMS installed and used in pilot schools		

Activity 8 WP 3.1c(i)-1	Integrate data from MEYS units, other government ministries, on schools, teachers, students, finance and assessment into TEMIS database (Rec 8 & 9).	Priority	1
		Cost	AUD 3000
			USD 2250
Description: As data on schools is collected also by other MEYS units and other government agencies, it has been recommended to integrate the data into the TEMIS database. This includes linking data reported to school supervisors on teacher and student attendance, financial data on school income and expenditures, and student assessment data (TUSTA, TSC, and SPSFC). Teacher data is also collected by the HRM and financial budget data is collected by the Planning and Budgeting department.			
EMIS Unit role	Design and development of TEMIS data tables to store additional data		
Target group	TEMIS Unit		
Output	Integrated TEMIS database		

| Activity 9 WP 3.1c(i)-4 | Publish final data tables in Excel on a national website and prepare a sector-wide statistical report to include TVET and Tertiary Education (Rec 10 & 11) | Priority | 1 |
| | | Cost | Nil |

Description: The TEMIS system produces statistical tables that can be exported in Excel format for data users. However these tables are currently not accessible to non-TEMIS users. Once the data is finalised, the tables need to be published on the MEYS website along with metadata to describe the data presented in the tables. The tables can also be published in the annex of the statistical report for the education sector. The Excel tables can also assist in the completion of the UIS questionnaire.

EMIS Unit role	Preparation of final tables and statistical report
Target group	Key education stakeholders
Output	Published statistical tables and report on MEYS website

Activity 10	Develop school and institution profiles for each island to improve decision-making at the community level (Rec 12)	Priority	1
		Cost	AUD 4000
			USD 3000

Description: An information profile on school/ island level data needs to be designed and produced for each institution. This will assist schools/islands in local planning, including the development of school policies. For bench-marking purposes the profile should compare school /island data on students, teachers, and resources with national level data. The profile should be distributed to schools as soon as the annual survey data is processed.

EMIS Unit role	Design and Production of School Profile information sheet
Target group	School leaders and committees
Output	school profile information sheet distributed to schools

Activity 11 WP 3.1c(i)-1	Develop a formal process for dealing with data requests and train TEMIS staff on developing queries to respond to specific data requests (Rec 13 & 14)	Priority	2
		Cost	AUD 4000
			USD 3000

Description: A formal process needs to be developed for dealing with data requests, including keeping a record of data disseminated to key stakeholders. The EMIS Unit should maintain a log book registering both adhoc and regular data requests. Details such as name, request details, date of request, date of data delivery, technical assistance provided should be recorded. In addition a data user satisfaction survey should be conducted to assure quality of data provided (e.g. accuracy, timeliness). To ensure timely and accurate data is provided to users, training in constructing database queries should be provided to TEMIS staff.

EMIS Unit role	Maintain log book of data requests. Design and develop SQL queries from TEMIS database
Target group	Regular and ad-hoc data users
Output	Up-to-date log book of data requests. User Satisfaction with quality of data provided.

Technical and human resource capacity

Activity 12 WP 3.1c(i)-3	Improve TEMIS officers' data analysis and report writing skills and train MEYS senior staff on the use of data for policy monitoring (Rec 15 & 16).	Priority	1
		Cost	AUD 7000
			USD 5250

Description: The analysis, reporting and use of education statistics is a critical function for MEYS as it is the basis of evidence-based policy making. The conduct of a data analysis and report writing training will ensure that MEYS staff, including the TEMIS unit, build and enhance their capacity to analyse and report data from TEMIS. In addition training on developing education indicators and using M&E frameworks will ensure that data is used in the policy monitoring process.

EMIS Unit role	Coordinate DA & ME workshops in conjunction with SPC/UIS
Target group	TEMIS unit and MEYS policy and planning unit.
Output	Skilled data analysts, report writers and M&E experts.

Activity 13 WP 3.1c(i)-3	Ensure ICT and statistical support is provided under a qualified EMIS data management. (Rec 17)	Priority	2
		Cost	AUD 2250
			USD 3000
Description: A qualified and trained EMIS data manager with skills in both ICT and statistics is needed to ensure the efficient and effective operation of the TEMIS system. The manager should also be supported by the ICT unit and have a statistical assistant to conduct day to day TEMIS operations, including follow up and checking of school survey forms.			
EMIS Unit role	E-learning and training via internet of UNESCO/SPC training modules		
Target group	TEMIS staff		
Output	On-site capacity development and support		

5. Multi-Year Work Plan

Outputs	Activities	Time-frame (Qr)				Responsible	Budget		
		Y 1	Y 2	Y 3	Y4		Source	Description	Amount
Output 1.1. EMIS Policy finalised	Develop an EMIS policy		4			Director of Education			Nil
Output 1.2. Change management process established	Establish a change management process	4				Director of Education			Nil
Output 1.3. User Consultation meetings held	Hold regular consultation meetings with multi-sector data users	4	4	4		Director of Education			Nil
Output 2.1. Increased scope of data collection implemented	Expand scope of data collection to include TVET & tertiary educ.		3			TEMIS Manager			Nil
Output 2.2. School enrolment form developed	Develop a standardized school enrolment form for SIMS	2				TEMIS Manager			Nil
Output 2.3. Data processes documented	Document procedures for data processing	4				TEMIS Manager			Nil
Output 2.4. Integration of relevant data in EMIS	Integrate data from MEYS units and other government ministries		1			TEMIS Manager	SPC	TA Costs	AUD 3000
Output 2.5 Data tables published on website	Publish final data tables in Excel on a national website	1	1	1		TEMIS Manager			Nil
Output 2.6. Statistical report published	Prepare a sector-wide statistical report	1	1	1		TEMIS Manager			Nil
Output 2.7. School profiles developed	Develop school and institution profiles	3				TEMIS Manager	UIS	TA Costs	AUD 4000
Output 2.8. Process for data requests developed	Develop a formal process for dealing with data requests	4				TEMIS Manager			Nil
Output 3.1. MEYS staff trained in data analysis and report writing	Conduct training in data analysis and report writing for policy		1	1			UIS/ SPC	TA Costs	AUD 7000
Output 3.2. EMIS manager is training in ICT & Stats	Train EMIS data manager in ICT and statistical processes		1	1			UIS	Internship Costs	AUD 4000
Output 3.3. TEMIS staff trained in SQL queries	Train TEMIS staff on developing queries to respond to data requests	4					SPC	TA Costs	AUD 3000

6. Final Comments

1) **Management of EMIS project**
   - Status of school submission of data by school giving breakdown by section of school data (number of students, number of classes, no past days of attendance not completed, student personal details, infrastructure, etc.) .
   - Detailed report of classes per school with enrolments per class (M, F).
   - Reports should be possible for individual schools, regions, school type (primary, secondary, public, private, special education, etc).
   - The possible inclusion of student performance data in the student records

2) **Sustainability of EMIS**
   - Capacity building plan for MEYS managers in use of EMIS to support management, analysis and planning, and M&E.
   - Plan for institutionalization of the EMIS at all levels.

3) **Promote and establish ownership by MEYS of TEMIS**
   - Establish a user support structure for TEMIS
   - Establish a mechanism for requests for, and implementation of, changes to the EMIS and a change management process specifying the sequence of activities and documentation required to ensure that the request is addressed, responded to and implemented if feasible and necessary.

4) **EMIS policy**
   The institutionalization and continued effective use of the EMIS requires a national policy specifying timelines, roles and responsibilities and consequences of non-compliance with the policy.

   a) <u>Work with the policy team of MEYS and stakeholder representatives in formulating the national EMIS policy for Tuvalu.</u>

   b) <u>Consult with stakeholders at all levels at appropriate stages of the drafting of the policy.</u>
      To ensure:
      - Stakeholder comprehension
      - Stakeholder agreement
      - Realistic representation of the roles and responsibilities at each level (school, Island, national).