Response to Reviewer Comments – 12 March 2018

Report title	Environmental Information System Gap-Analysis for Kuwait Environment Public Authority
Report #	0096804-1/ 8 Feb 2018

The author wishes to thank the reviewers for their time and effort in reviewing and commenting on this report.

Response to Reviewer #1Comments		
Reviewer comment		**Authors' Reply**
1	Page 12 In eMISK we have three workflows for data collections 1. Data collected from sensors, automatically comes to eMISK database 2. Data from laboratories or independently in field. eMISK has already developed some online applications and in process to develop more application where department can use web applications or mobile apps to collect data 3. Data from Stake holders and partners (Local Partners, regional and International organizations) (eMISK has already developed integration services to pull data from some sources)	The author agrees with the reviewer that eMISK accesses different data sources and these were included throughout the rest of the report. This comment will be incorporated in the final report to clarify.
2	Pg 12. This is not valid ArcGIS provides all possible types of analytics, viewing, editing and publishing of both geospatial data and non-spatial data. Insights for ArcGIS is a web-based, data analytics workbench where you can explore spatial and non-spatial data, answer questions you didn't know to ask, and quickly	The author agrees with the Reviewer that ArcGIS is a comprehensive geoanalytical tool and that Insights for ArcGIS is a useful data visualization and exploration tool, similar to Tableau. The author is only concerned with existing software licenses – Tableau is already available. There was

	deliver powerful results.	no mention of Insights for ArcGIS. The author would welcome some form of documentation or confirmation that Insights for ArcGIS is being used throughout KEPA – other than just in eMISK. The author realizes that not every utility and software tool was captured during the report – only the major solutions that are deployed throughout the agency.
3	Pg 15, Envista is not maintained my EPA IT but rather hosted in eMISK data center maintained by currently EWC	The author agrees with the Reviewer that the Envista ARM license is not maintained by KEPA IT, however it was never asserted in the report that it was. The report is concerned about the functionality of the software and its utility to KEPA operations. Internal management, while important, is not the main focus.
4	Pg 24, As part of eMISK enterprise application we have already applications in production that are used by lab departments to upload data directly eMISK, currently it covers Coastal, Marine, Drinking Water etc. We are going to develop or configure more web applications or mobile apps that will cover field data collection and other datasets	The author agrees with the Reviewer that eMISK has several applications including the eMISK Data Uploader designed for templates developed by individual departments. While the author commends the initiative to develop new applications, the report considers unfielded applications as gaps.
5	Pg 24. EPA has 15 Marine buoys only. Marine Buoys application server and database server is hosted in eMISK data center but maintained by third party vendor namely Burgan.	The author thanks the reviewer for pointing this out and will make the necessary corrections in the report.
6	Pg 31. As per government mandate all government agencies should connect with each other using KIN network. In eMISK only public websites can be accessed externally rest will work only through EPA network or will be made available to external agencies using KIN. However in any case services hosted at eMISK are hosted at SSL (Secure Sockets Layer) with authentication and authorization. eMISK Data center follows Standard IT security policy.	The author is grateful to the Reviewer for this clarification, however many stakeholders, especially in the energy sector, do not want to share direct access without more thorough security procedures. As the report mentions, one solution may be to re-assess the data needed in terms of time frames. If monthly data is required based on agreed upon permit to operate conditions, then emailing a spreadsheet is sufficient. This method is ideal for EQuIS that allows automatic data checking and population.
7	Pg 31. In past we have lot of discussions and meeting regarding using EQUIS. I'm not updated about final report of using EQUIS. The potential rider are 1. EQUIS uses its own database and data collection process.	The author acknowledges the Reviewers comments. It is clear that the Reviewer is not familiar with EQuIS welcome the opportunity to demonstrate EQuIS's capabilities. 1. EQuIS has its own schema that can easily push data

	Then to use same data in eMISK we have to build system that will import this data from EQUIS to eMISK Database. 2. We have to engage with external stake holders to use EQUIS. 3. EQUIS doesn't work with ArcGIS server based services	to the eMISK DB without any system modification. The data from the stakeholders is checked for errors and is technically correct. This includes a wide range of metadata that eMISK is not collecting. 2. External stakeholders, including KNPC, MEW and MPW, are already using EQuIS to submit monthly data. 3. EQuIS is an ESRI partner and integrated seamlessly with ArcGIS products. KEPA has 5 licenses for EQuIS for ArcGIS.
8	Pg 32. eMISK has direct link with MEW now. eMISK has built SQL Server Integration Services that is used to migrate data directly from MEW database to eMISK Database. Features of process are 1. This process can be scheduled according to EPA requirement currently it's scheduled daily. So that means once MEW updates data EPA will get same data with a maximum delay of 1 day 2. It generates Water quality index automatically 3. Sample data and Water Quality index data is instantly available to all enterprise, public and mobile apps.	The author thanks the Reviewer for providing this information and will confirm its operation and the data/metadata being collected. The author will also confirm with MOH how they send collected data.
9	Pg 35, EPA has started a comprehensive project for Waste	The author agrees with that reviewer that a Waste Mgmt project has started, but since a waste mgmt solution has not been fielded, there is an existing gap.
10	Pg 35, eMISK has database for incident management	The author agrees with that reviewer that eMISK has an incident management layer, but that it is an incomplete solution and does not represent a usable reporting system.
11	Pg 36, This option needs to be explored more and check how EQUIS can complement Waste project	The author agrees with that reviewer that this option should be explored and considered in the existing waste project.

12	This is statement is partially right. We have simple incident reporting system available as part of beatona although it's not used. eMISK maintains database for incident management where all incidents are stored and can be used for historical tracking and later analysis. eMISK is planning to have incident management system, which will include workflow for incidents, post incident response and environmental impact assessment using different models.	The author agrees with that reviewer that eMISK has an incident management layer, but that it is an incomplete solution and does not represent a usable reporting system. As mentioned before, an unfielded system is considered a gap in this report.
13	This needs more clarification how EQUIS can be used in incident reporting and management. EPA is anticipating solution where Incidents can be reported based on certain event. Incident management system will use this event data with other relevant datasets and model this for further analysis to map the response. Finally there will be environmental impact assessment process because this incident.	The author thanks the reviewer for this comment. EQuIS is not a stand alone system but a data management system that works with other systems. For incident management, EQuIS can be used to accept an incident reporting EDD and lab reports associated with response sampling. These results would be available for an incident report as well as historical analysis.
14	Pg 40, I don't think it will easy and appropriate for EPA users to R. It is better to recommend user friendly Statistical software that can add value to environmental data present at EPA.	The author thanks the reviewer for this comment but humbly disagrees. R is very easy to use software, especially when used with RStudio. If a user can use Excel, they can use R. Since even "user friendly software" requires some training, the same training can be used for R, without the need for license and maintenance costs. The fundamental issue though, is not the software, but the statistical understanding to know which methods and equations to apply, how to interpret the results, and how to use the results effectively. Unfortunately, the report did not evaluate user knowledge of statistics. The author highly recommends that at basic statistics and significance testing be included as well as software training. If the reviewer is unfamiliar with R, the author would be happy to demonstrate its features.
15	Pg 42, Here needs more elaboration. However to make thigs clears eMISK is storing all historical source data in enterprise database and is made available to EPA staff and public (limited to some data) using different web and mobile apps.	The author agrees with the reviewer that historical data is being stored, but that the data stored represents the data submitted to eMISK, not the raw data collected by the department with its associated metada.

16	Pg 42, eMISK has already developed some application that is used by departments to directly update data. Like Water update tool, Marine outlet tool	The author agrees with the reviewer that some applications are in place, however based on interviews and discussion, the data is uploaded by eMISK technicians, not the departments. While this can be corrected through management procedures, the fact still remains that the data being uploaded is summary data, and not the raw data.
	Pg 43, To put things in context EPA departments use these templates for official reporting. So at eMISK one of our priority was to not double their work to fill another template that will be used for eMISK data updating. Now workflow is like this 1. Departments to analyze of samples. 2. They fill the templates which they use for reporting and also in some cases the form based application are made available to EPA departments. 3. Then upload these templates using secure and authorized application which is part of eMISK enterprise to central database. Then data comes directly to eMISK database However it's pertinent to mention here eMISK Stores the data using four column.	The author agrees with the reviewer in regards to the workflow but would like to focus on the last portion of the comment that recognizes that only 4 fields are stored. This shows that metadata is not being captured and stored in eMISK, but should be available. Integrating EQuIS to capture the complete data set and pushing the summary data to eMISK maintains the workflow, but ensures that critical metadata is not lost.
17	In past we tried and invested lot of energy but landed in no final solution zone. I'm not sure what happen finally (Refer Eng.Ahmed and Dr. Marwan).	The author thanks the reviewer for this comment and will follow up with appropriate authorities.
18	Pg 40, It will not be appropriate for EPA users to use this system (R) they need some user friendly software's.	The author thanks the reviewer for this comment but humbly disagrees for the same reasons cited in comment 14.
19	The current datalink with MEW is seamless and automatic but using EQUIS here will add more work to EPA. Pertinently it will be overhead for MEW to use EQUIS.	The author thanks the reviewer for this comment but humbly disagrees with the reviewer's assertion that EQuIS will add more work. Data is collected in an Excel template, checked and emailed. Several external stakeholders are already using the system and have no complaints. Additionally, hundreds of agencies and thousands of clients worldwide are using similar systems with no complaints. While the current system may be working seamlessly, the author will confirm the data

		sets being collected in order to evaluate metadata collection.
20	Report should have suggested the list of analytical, statistical and decision making software's that can be integrated with eMISK system.	The author thanks the reviewer for this comment and humbly directs the reviewer to page in which recommended statistical analysis software, R, is recommended. Since eMISK is using ArcGIS, then Python should be used as it is already integrated into the software. Evaluating additional software is also out of scope of the report.
21	Report should have included the mapping of environmental law with data collection of EPA and listed the data gap.	The author thanks the reviewer for this comment and humbly directs the reviewer to Section 4.1 in which data management gaps and requirements are identified.
22	Report should have included the mapping of EPA regional, National and international commitments with data collection, processes, reports. It should have highlighted the gap and possibly how it can addressed.	The author thanks the reviewer for this comment and humbly directs the reviewer to Section 4.1 in which local regulations and SDG are highlighted and addressed. As mentioned in the 1st chapter, the report only reviewed requirements on the EPL and associated regulations. The EPL incorporated international requirements and conventions.
23	Report should have recommended solution for integration of different systems like eMISK marine, eMISK Air, eMISK Waste etc. How these system can complement each other.	The author thanks the reviewer for this comment and humbly directs the reviewer to Figure 5.1 in which a proposed integration of platforms is recommended.
The authors would like to thank the reviewer for his/her comments that will greatly improve the report.		

Response to Reviewer #2 Comments		
Reviewer comment		**Authors' Reply**
1	There is a formal incident reporting method, for industry. The companies send official letters or e-mail, to the responsible EPA Departments. Reports about these incidents and their follow up activities are stored in "Environmental Incidents Database" in eMISK.	The author thanks the reviewer for this comment but humbly disagrees with his assessment. An official letter is not the same as a reporting system with required data fields. The author found no letter template or reporting format for stakeholders to use and therefore stands by the assertion that there is no Incident Mgmt system in place.
2	Based on our information, the violation system keeps records of the violations assigned to individuals, businesses, and facilities. Please check with the responsible Dept.	The author thanks the reviewer for this comment and assures the reviewer that he did check with the responsible department.
3	We suggest that those critical parameters are listed for each domain in the report. This will give a better insight for EPA staff to stress on these parameters.	The author thanks the reviewer for this comment and refers the reviewer to the list of parameters in Table 4.8. While this is a general list for water, soils and sludge, it represents the level of metadata that should be collected for any environmental chemistry sample. The short duration of this contract (3 months) also prevented a more thorough evaluation.
4	Page 12, line 207, "**eMISK includes GIS analysts as well as the software, and has initiated several ambitious projects to enhance its position in KEPA including …**", Whose position? What is meant here by to enhance its position in KEPA? Please clarify	The author thanks the reviewer for this comment and agrees that it is awkward. It will be reworded in the final report.
5	Page12, Table 2-5 there is no "MEW Domain" in eMISK. >> Do you mean "Water"? What does "NOT USED" mean in the Table?	The author thanks the reviewer for this comment. The MEW domain refers to the power generated used for GHG calculations. The reference was given to the author by eMISK analysts who said that the layers were present but not being populated.
6	Page 12, line 212, "**Currently, eMISK takes summary data sets directly from reporting departments and manually uploads it based on pre-formatted templates in Excel**" >> Generalization of all data sets are not applicable, for example air quality data and drinking water quality.	The author thanks the reviewer for this comment and agrees that it is a generalization, however it is applicable for many data sources. The statement will be modified to clarify the intent of the author.

7	Page 21, line 459, "**Notification of incidents usually takes place with a phone call or WhatsApp message.**" >> This text does not accurately explain the real situation. The incidents data should be formally reported by the responsible organization to the related Dept. in EPA through official letters or e-mails. Then, these data are stored in the Environmental Incidents DB.	The author thanks the reviewer for this comment and refers the reviewer to the response in comment 1.
8	Page 24, line 539, "**Marine Support Services Section operates a series of 20 monitoring buoys that provide real time datasets directly to eMISK.**" >> The datasets are not stored into eMISK Database	The author thanks the reviewer for this comment. The author will confirm the datasets and modify the sentence if necessary. A previous reviewer has already pointed out that the number of buoys is 15, and not 20.
9	Page 31, line 688, **"The risk that stakeholders see is in regard to internet security and possible hacking of their data. Better encryption techniques must be provided or use of virtual private networks (VPNs).** >> The connection with public organization has to be done through Kuwait Information Network (KIN). All data exchanged between eMISK and external government entities are transferred via KIN under CAIT supervision and approval. The data linking with private organizations has no restrictions from eMISK side and can be done using encryption techniques or the use of virtual private networks (VPNs). We feel that the concern is not valid.	The author thanks the reviewer for this comment but humbly suggests that all data security concerns are valid and should be addressed on a case by case basis. As pointed out with another reviewer, some connections can be eliminated by properly assigning permitted operating conditions and reporting on monthly basis with EDDs as an email attachment.
10	Page 31, "**This assumes the need for streaming real time data. In most cases, monthly data is sufficient to meet monitoring requirements, especially without specific operating permits that identify which emission unit or discharge point needs to be monitored, what chemical parameters should be monitored, and how frequently."**>> Most of the monitoring data are already streamlined to eMISK Geodatabase in real time. We could also argue that monthly data is not sufficient for monitoring requirements. Current requirements from KEPA departments depict the need for real time data at least for Air and Marine quality.	The author thanks the reviewer for this comment and agrees that streaming data is near real time series data. This does not remove the need to provide operating criteria for emission sources. Determining the time frame and frequency of reporting is out of scope of the report, however identification of gaps in data acquisition showed that in many cases, monthly reporting can adequately meet the time series requirements, especially since there are no systems currently deployed that can effectively use near real time sources. This would require artificial intelligence and advanced machine learning based decision support systems that require a large amount of historical data to complete training, parameter

		validation, and testing. This, unfortunately, was also out of scope of the study.
11	Page 32, line 716, "**MEW and MOH provide drinking water sample results monthly in Excel**" >> Since March 2017, the drinking water analysis results are received directly via Direct linking between MEW DB and eMISK Database through Kuwait Information Network (KIN). Also, this analysis results data appears automatically in Beatona Website.	The author thanks the reviewer for this comment and will make the necessary corrections to the report.
12	Table 4.3 Page 35, the EIS Requirement "**Incident Mgmt DB**" is listed as **EXCEL**>> eMISK has an Environmental Incidents Database Layer.	The author thanks the reviewer for this comment and will make the necessary corrections to the report.
13	Page 42, line 887, "**Table 4.7 shows that the source data is not readily available for historical analysis and must be extracted from individual Excel worksheets at the originating section**." >> This sentence is not clear. Although, the data are manually extracted but the historical analysis of the data is readily available and possible for the TS datasets in eMISK. The datasets are updated once data are received. Generalization can't be applicable here.	The author thanks the reviewer for this comment. While historical data is available through eMISK, it is only the data reported, and not the raw data and metadata. This seems to be a general limitation throughout all eMISK layers.
14	In Figure 5.1: Initial recommendation for new data work flow >> A. Tableau is not the only terminal program i.e. Beatona, eMISK Enterprise Apps, …etc. B. Violations are planned to be connected to eMISk using Inspector App (under development). So, it should be connected to eMISK in any future work flow.	The author thanks the reviewer for this comment; however, the author humbly reminds the reviewer that unfielded systems and applications are considered gaps.
15	Page 59, **Table 5.1:** Initial recommendation for new data work flow>> The logic behind Table 5.3 is not clear. How has the conclusion that EQuIS is the best option been reached? Are there any other options that are not currently exist in EPA? In a report on Environmental Information System Gap-Analysis for Kuwait it	The author thanks the reviewer for this comment and would like to direct the author to CIMS project that implemented EQuIS. This project selected EQuIS. The author would like to also remind the reviewer that as a gap analysis report, the focus is to evaluate gaps – in this case, there is no gap in

	is important to generalize the solution concept and provide alternatives for this solution, which is not applicable in this report.	regards to the role EQuIS plays in data acquisition and processing. The gap exists in how it is used, integrated with eMISK, and deployed with other stakeholders.
16	The report structure and many of the comparisons and tables shown in the report are difficult to follow. Hence, the comments included in this are mostly on specific instances rather than the complete report. We also strongly recommend having the statistics presented in the report reviewed by an expert.	The author thanks the reviewer for this comment and regrets any difficulty regarding organization. The original draft went through several external reviews with experts outside of Kuwait who gave valuable feedback and evaluated all calculations.
The authors would like to thank the reviewer for his/her comments that will greatly improve the report.		

Response to Reviewer #3 Comments		
Reviewer comment		**Authors' Reply**
1	Table 2.2, line 175, Add section three: Protection of the ambient air from pollution	The author thanks the reviewer for identifying this error. The revised copy will reflect the correction.
2	Lines 368-384, Replace existing text with suggested text **Suggested:** Kuwait signed the united nations framework convention on climate change (UNFCCC) on Dec.28th 1994, protocol Kyoto on March 11th 2005 and Paris agreement on April 22nd 2016. The environment public authority is the focal point of the state of Kuwait for the (UNFCCC) ,based on that Climate change section is responsible for fulfilling any commitments regarding UNFCCC such as preparing the national communications (NC's), biennial updated reports (BUR's), national determined contributions (NDC's), national adaptation plans (NAP's), national appropriate mitigation actions (NAMA's), national monitoring, reporting, verification framework (NMRVF) and any reports required in the future. Therefore, the climate change section needs a huge amount of data from relevant stakeholders in an excel format to facilitate the handling of the data in the relevant software used. The UNFCCC adopted the intergovernmental panel on climate change (IPCC) as the certified source for the scientific inputs to prepare any reports such as (GHG inventory, adaptation scenarios, mitigation scenarios etc.…), so the Climate Change section is supposed to follow the methodologies and scenarios from the IPCC in their reporting to UNFCCC. Furthermore, some of the outcomes of the second national communication (which is estimated to be submitted by the end of 2018) will emphasis the EPA information system by establishing National monitoring, reporting, verification framework (NMRVF) and national inventory system (NIS) that will be installed in March 2018.	The author thanks the reviewer for providing the suggested text and will carefully consider including it in order to enhance the report. In regards to a National Inventory System, the report considered all unfielded systems as gaps. While an NIS may overcome the data collection and management gap, the existing AQMIS is already installed and fully capable of meeting section requirements.
3	Line 1155, Replace existing recommendation to use AQMIS to calculate GHG emissions with Using NIS and IPCC-2006/1996 guideline for national GHG inventory or any guidelines that adopted the UNFCC convention.	The author thanks the reviewer for submitting this comment. AQMIS can use UNFCC/IPCC guidelines and emission factors for GHG. A key feature the AQMIS is able to do is to evaluate Tier 3 & 4 inventories, and not Tier 1 & 2 levels currently being used. Under IPCC guidelines, countries are allowed to use their own methodologies as long as they are approved. AQMIS provides a repository for the large amounts of data submitted by emission generators that also include hazardous air pollutants. The same sources create both GHG and HAPs.
4	Line 1181. Remove the recommendation to prepare national emission factors for GHG calculations.	The author thanks the reviewer for submitting this comment but humbly disagrees with the request. Using the current Level 1 and 2 GHG inventory methodology leads to significant over estimation of GHG emissions. In order to

		provide a more accurate representation of the emissions of Kuwait, evaluation of the fuel feedstocks should be completed and the emission factors calibrated. The current IPCC methodology provides ranges of thermal values for each fuel type, relying on the default value may negatively impact Kuwait's reporting levels. At the very least, evaluating the factors against existing fuel feedstocks should be performed to validate their use.
5	Line 1203, add a recommendation for stakeholders to set a focal point for data collection.	The author thanks the reviewer for this comment and agrees with the need for stakeholders to provide data collection focal points. During interviews with external stakeholders, it was apparent that there already were assigned person responsible for liaising with KEPA and providing necessary data sets when requested.
6	Table 5.1, Lines 1215, Remove #20, 28 and 36 and replace with previous suggestions.	The author thanks the reviewer for this comment but humbly refers to the responses in comments 3, 4, and 5.

The authors would like to thank the reviewer for his/her comments that will greatly improve the report.