

Risk Request for Proposals: Comments & Responses

Introduction

In September 2009, the Risk Focus Group (consisting of Robin Spence, Charles Scawthorn, Mustafa Erdik, Andrew King, Helen Crowley and Rui Pinho) met in Cambridge to draft an initial set of Requests for Proposals for the Risk Global Components of GEM. The following RfPs were drafted and subsequently uploaded to the GEM website:

- GEM Ontology and Taxonomy
- Global Exposure Database
- Global Earthquake Consequences Database
- Global Vulnerability Estimation Methods
- Inventory Data Capture Tools

In order to obtain feedback from the wider risk community on the planning of the risk activities in GEM and the structure, content and budget of the RfPs, an online peer review system was set up through the website in order to receive comments on each RfP. Contributors were asked to answer the following questions and then provide any further general comments:

- 1) Is the document clear and understandable, as to what is required and is to be delivered?
- 2) Is the period of performance adequate?
- 3) Is the budget adequate (keep in mind that the total for all proposals cannot change)?
- 4) In your opinion, how useful will the products of this RfP be?
- 5) How likely is it that you will respond to this RfP?

This peer review system remained open from 16/10/2009 until 23/11/2009 and the comments that were published on the website are reported below together with the responses of the Risk Focus Group (shown in red). In addition to the modifications to the specific RfPs which have been undertaken based on these comments, it was felt that an additional document was needed that explains the rationale behind the 5 RfPs and how they are integrated, and that describes GEM's policy on open-source software and the need for the consortia to interact with GEM's Global Model Facility.

Both the Scientific Board and Governing Board of GEM agree that the consultation process has been successful, having drawn responses from a good number of experts (though with a disappointing focus on Europe and the US); also, they agree that the comments have largely been about clarification rather than challenging the proposed structure of the RfPs.

General Comments

The Socio-Economic Impact module Working Group believe that experts in the field of socio-economics should be involved in the consortia of the risk RfPs to ensure that data that could also be of use in the SEI module is being collected (e.g. in the Global Exposure Database), that future data collection on losses follows the necessary standards (e.g. in the Global Consequences Database) and that there is a common ontology and taxonomy.

The Risk Focus Group (RFG) agrees with this proposal by the SEI Working Group and when publishing the RfPs will recommend that consortia combine experts from both risk and socio-economic domains.

Submitted by EERI, PUBLISHED

GEM provides a unique opportunity to build an international network of individuals to address global seismic safety. This network would serve to provide resources to GEM as well as to disseminate its results to regional and local organizations for building awareness and taking action to reduce risks. We encourage GEM management to take advantage of this opportunity. There are a number of existing organizations and initiatives that are useful as models or starting points for this effort.

There are member organizations similar to EERI in many countries. EERI has formal mutual agreements with several of these and working relationships with many others. These organizations generally are related to the International Association for Earthquake Engineering (IAEE) which could serve as an umbrella for a unified resource.

EERI and the IAEE sponsor the World Housing Encyclopedia, a web-based network of international experts in earthquake engineering. This group has developed procedures to produce reliable, consensus-based information on community construction and retrofit measures in many countries. In addition, this network has most recently worked directly with the PAGER model to provide fragility and vulnerability information on a wide variety of construction technologies around the world. These existing relationships and procedures are non-proprietary and are directly transferable to the GEM effort. As an organization, EERI is prepared to work with others to address GEM's specific goals.

The RFG appreciates these comments from EERI and can confirm that GEM intends to utilize existing initiatives as far as possible and will make this clear when publishing the RfPs.

Comments on GEM Ontology and Taxonomy

Submitted by James Daniell, PUBLISHED

ISO 3166: It is also important that GEM uses the correct terminology in terms of countries for the RfPs. i.e. using ISO 3166-3 country definitions. That way, although some political boundaries and conflicts are breached, it gives every recognised country, a chance to look at their losses. Earthquakes do not know borders, but unfortunately the political situations inhibit socio-economic relief as well as seismic codes, and thus it is best to have a large number of countries, rather than just UN defined ones. Also careful thought needs to be look at in terms of places like Transnistria, Nagorno-Karabakh, Abkhazia, and South Ossetia. This is a very important definition as most census data for the building inventories and other data is affected by these decisions i.e. in terms of a Global Consequence Database.

Flexibility on Ontology and Taxonomy: It is very important to have a socio-economic group to contribute on this level and to have a very clear idea of what the socio-economic RfPs will contain before calling for proposals. Otherwise the taxonomy will lack the flexibility to incorporate the socio-economic section.

For me, this is one of the most important parts of GEM as well as the Global Consequences Database, in order to standardise the large amount of discrepancies in definition and data within the entire world earthquake information base.

i.e. what does the word 'affected' mean? Numerous different definitions have been provided. It is up to GEM to standardise these types of issues. If the taxonomy RfP can be held until the socio-economic call for proposals then a better result will occur.

The suggestions on the implementation of ISO 3166 will be passed on to the consortium that are eventually selected to work on this GC.

This GC should cover all three scientific modules of GEM and although it is being released with the Risk RfPs it is not supposed to cover just taxonomy and ontology in "risk". This will be made clear when the RfPs are released, and it will be recommended that the consortium involves experts from all fields.

Comments on Global Exposure Database

Submitted by Mohammad R Zolfaghari, PUBLISHED

- 1) yes
- 2) yes
- 3) yes (please see my comments)
- 4) very useful
- 5) quite likely

Depending on the geographic resolution of input raw data, such data might not be free and perhaps quite costly in some countries. The proposal does not refer to the cost of acquiring raw census and built environment data from authorities in different countries and who should pay that: GEM or the consortium. For example to purchase such data for China on County-level, there would be a cost of at least US\$5K involved. The same data for this country on township level costs some US\$64K.

The consortium will not be expected to purchase any census data and this will be made clear in the RfP. Collaboration between the Global Component consortia and the GEM Regional Programmes will be established through the GEM Secretariat and this should assist the acquisition of data. Furthermore, the GEM Secretariat will strive to obtain such data through the country agreements with the Public Participants. Hence, an effort will be made by the GEM Secretariat to assist the consortium working on this GC in obtaining the necessary data. These comments will be added to the RfP.

Submitted by James Daniell, PUBLISHED

This is also a very good RfP, and I look forward to contributing. An idea is to remove the minimum 4kmx4km definition, and then change that to a population density based descriptor. In large urban cities, 4kmx4km may reduce the accuracy of functions due to overlap issues. Conversely, in rural settings, 4kmx4km definition is ok.

The RFG felt that some indication on the minimum resolution should be given, but it will be stressed now that a higher resolution would be preferable.

Submitted by Fred Turner, PUBLISHED

I suggest you clarify Task 1 to include a summary of existing databases of inventories throughout the world and a comparison of them across countries to help identify inventory gaps, as well as the strengths and weaknesses of the inventories. A new Task 3 should be considered to develop and tailor specific recommendations and best practices for each country so that governmental and nongovernmental organizations can most efficiently revise and update their inventories so that the GEM can put the databases to the most efficient use in future versions of the GEM. Recommendations from GEM should rank and incrementalize suggested improvements in databases since data collectors typically have limited resources. Such advice will enable data collectors to make more informed and strategic decisions about which types of data to collect first in the near future.

The RFG agrees with these suggested additions to the RfP and will include them accordingly.

Submitted by Jochen Schwarz and Syed Tariq Maqsood, PUBLISHED

- 1) yes
- 2) yes
- 3) yes
- 4) very useful
- 5) quite likely

Preamble

Building exposure should be linked with Tier 5 (Vulnerability Estimation) and the concept of European Macroseismic Scale-1998 (EMS-98) could be adopted.

There should be a clarity about the intended “flexible approach”; the open database alone is not sufficient to ensure the movement between levels of different refinement (i.e. micro, meso and macro scales).

TASK 1

This could be done in the frame of existing institutions (e.g., Taskforces for Earthquakes).

TASK 2

The definition of typical building types should be linked with their corresponding ranges of Vulnerability Classes acc. to European Macroseismic Scale-1998 (EMS-98). This is also helpful to ensure the use of damage surveys from previous and (probably) coming earthquakes.

Check the development of seismic code in a specific area to get comparable levels of earthquake resistance design for so-called engineered structures.

Model and test sites are required; they should be selected to ensure geo-statistical extrapolation in Tier 5

PROJECT MANAGEMENT PLAN

This is also a question to train qualified people; institution and courses are to be checked where institutional and/or academic training (e.g. special international Master courses) could be provided. Because this matter cannot be solved in GEM alone (as low budget for global level), there should be a continuous network of education.

The Global Exposure Database will indeed be linked with the Vulnerability Estimation Methods GC through the Ontology and Taxonomy RfP – the same taxonomy of buildings will be considered in both. In order to clarify the relationship between the global components, a single document on the Risk RfPs will be written to explain how the RFG believes these components should be integrated.

Where possible, collaborations with existing institutions will be set up by the GEM Secretariat and these can be leveraged by the consortia working on the global components.

Rather than use the EMS scale, the Ontology and Taxonomy group will work with the Vulnerability Estimation group to develop a building classification scheme which will be used by all consortia.

The comments on developing a network of education will be considered by the GEM Secretariat when planning the training and capacity building activities.

Submitted by Dominik Lang on behalf of NORSAR, PUBLISHED

This project definitely needs to be well coordinated with and adjusted to Project 1 ‘GEM ontology and taxonomy’ as an efficient and distinct generation of a homogeneous inventory database will require fixed definitions and stipulations of all input parameters. This will be especially important in terms of a classification scheme of worldwide building typologies, occupancy classes, etc. Since these issues, however, will be investigated during the conduct of Project 1, it would have been necessary to first carry out Project 1 before Project 2 starts. Thus, the development of the global exposure database could base upon the outputs of Project 1. Conducting these two Projects simultaneously (most probably by two different consortiums) may undermine the efforts of the consortium that works on the Global Exposure Database due to various factors such as e.g. ‘last minute’ changes in the taxonomy/ontology output, adjustment/change of used and well-established definitions at the end of Project 1. In case that P1 and P2 are treated separately, there is a strong need to establish good communication channels between both consortiums so that a regular update is guaranteed. It should be stated in the call whether inventory data will be created for all parts of the world or if it is going to be limited to those regions with a hazard level greater than some threshold. If the latter is concerned, how will this threshold be defined?

Specific information should be provided on the platform which will be used to develop the database. This will be especially interesting with regard to proprietary (commercial) or open-source software (maybe GEM’s own development).

Further, the call for proposals should be more specific with regard to the question in which respect this database will differ from the USGS PAGER database and which features will be unique and innovative. According to our understanding, a close collaboration to or even inclusion of the PAGER/WHE project would be indispensable and beneficial for this project.

The call for Project 2 should further be specific on the questions “How” and “How frequent” can the exposure database change or being updated reflecting the constant changes in the real world? Will the exposure database be a static, a semi-dynamic (regularly updated), or a dynamic database? GEM should at least strive towards a semi-dynamic approach but should then be aware that the allocated funds may be only “a drop in a bucket”. [A step into this direction could be the

integration of Spatial Data Infrastructure (SDI) environments in order to provide, share, maintain and update inventory data.] If GEM is to collect and use a global database, single users and experts will detect errors, point to missing data, etc. GEM must develop an updating policy that allows critics to adjust the database (but according to some rules and processes). As indicated in the call, an exposure database should not only consider conventional buildings (e.g. of residential and commercial occupancy) but also those for emergency relief (hospitals, health centers, etc.), special (infra)structures (tanks, bridges, overpasses, etc.) or structures of large loss potential (power plants, dams, etc.)? Efforts to acquire information on the latter group of structures may be to no avail due to reasons of confidentiality (and, at least to my own opinion, will exceed the expertise of most of us.)

As mentioned previously, although the RFG understands that a phasing of proposals could be beneficial, it is believed that starting all Risk GCs together will aid integration of the activities of these GCs. However, as also mentioned previously, there will be a much stronger focus on the activities of the O&T GC during the first 6 months.

The inventory database should be for the whole of the world, though a prioritization of countries might be implemented based on preliminary global seismic hazard maps; this suggestion will be included in the RfP and it will be left to the consortium to decide how to prioritise.

The database should be based on open-source software; the consortium will have to work closely with GEM's Model Building Facility; this will be explained in an accompanying document on the Risk RfPs.

The comments on interaction with the PAGER group are acknowledged and although this will not be imposed on the winning consortium, it will certainly be strongly recommended.

The RFG confirms that GEM is striving to develop a semi-dynamic database where the data from the inventory capture tools can be input into the global exposure database; these issues will be clarified and recommendations on the use of Spatial Data Infrastructure environments and a wiki-style approach for updating the data will be included in the RfP.

Comments on Global Earthquake Consequences Database

Submitted by Abid Shaban, PUBLISHED

I am offering my reflections on the RFP. I have extensive experience in Earthquake mitigation and being based in Pakistan I have witnessed the unfortunate effects of incomplete data on past earthquakes.

1) The time line of data collection post 1930 is grossly insufficient. Extensive data collection can take place of EQ events post 1930, but Earthquake intensity data of past 300 years or more need to be plotted on maps. You have to understand the return cycle of Earthquakes is quite long.

2) The data /out come will be quite useful.

3) In my opinion, the budget is inadequate, especially if data of the entire world is to be plotted.

4) The time line of THREE years needs to be reduced to TWO years

5) Encourage OPEN SOURCE software.

Overall Good RFP.

The RfP states that data from a certain number of events needs to be input into the database and not data from all events for the entire world. The consortium working on this GC will be setting up an open-source, open access database that will need to be further developed and expanded by the community. This would allow data pre-1930 to be uploaded to the database, following a strict protocol that the consortium will identify. These issues will be made clearer in the RfP.

Submitted by James Daniell, PUBLISHED

Very Good RfP with just a few comments.

This RfP is very well set out. A suggestion comes in the form of your Task 3. I think this should be spatially defined. i.e. It may not be useful for the data on 50 earthquakes to come all from China or all from India. It should be set out that the data should come from varying development levels, and also varying continents, or a % of countries. Thus, you can then derive better results and look at more relationships. It is also important to ensure that the existing historical databases have been verified, as just using one existing database will most likely produce errors. I think it is also important to include as much information back to 1900 as there are some earthquakes in the time period 1900-1930 which provide very useful data i.e. the secondary effects of San Francisco 1906 and other data from such earthquakes, China, 1902, 1920, 1923, 1925, Japan, 1923 and 1927, Uzbekistan, 1902, Turkey, 1903, Chile, 1906, Italy, 1908, Guatemala, 1917, and numerous Central Asian earthquakes (Iran, Turkey and Turkmenistan) and even smaller earthquakes. This could be incorporated also on a sliding scale of accuracy to incorporate uncertainties.

The RFG agrees with the suggestion to propose a spatial distribution of earthquakes for the population of the database and will add this to the RfP. A former response has covered the pre-1930 data issue.

Submitted by Fred Turner, PUBLISHED

GEM should consider expanding Task 6 (User Documents). Since numerous protocols for collecting impact data already exist in many countries around the world, Task 6 should include a summary of these protocols, to identify their commonalities, strengths, weaknesses, and gaps. GEM should consider sponsoring workshop(s) where participants that represent these protocols are called upon to work together to help develop a preferred protocol for optimal future benefit by GEM and to encourage widespread adoption in their countries of the preferred protocol. This past summer's international damage and safety assessment exercise sponsored by the EU-STEP in L'Aquila has already initiated this dialogue that included many EU countries, Japan's BRI Damage Survey Method, and US's SAP-ATC 20 and Earthquake Performance Evaluation Programs. These and other existing protocols that collect impact data would benefit from GEM's unifying goal and potential support.

The RFG fully agrees with these comments and very good suggestions and will modify the Task 6 of the RfP accordingly.

Comments on Global Vulnerability Estimation Methods

Submitted by Dina D'Ayala, PUBLISHED

1) yes but it is not clear how many projects will be funded under this stream. This is essential to define the scope of the proposal

2) yes

3) yes it depends on how many projects get funded under the stream and how all-encompassing any project should be. Is it expected to establish consortia and collaboration based on clustering competitive bidders?

4) very useful

5) quite likely

The 5 streams published are of course strictly interrelated, but it is not clear at this stage whether bidders are expected to cover more than one stream with one proposal project and whether proposals covering more than one stream will be considered more suitable. To produce robust results from this stream, much of the Ontology and taxonomy and inventory data should be in place, so maybe some phasing should be considered. Vulnerability methods used might vary substantially depending on composition of building stock and it is not clear in the call whether a proposal will need to cover all types of buildings or specific types at a global scale, or whether both will be accommodated within the call.

Proposals should be submitted to each stream separately, and anyone interested in bidding should join together with other partners to form a consortium that will respond to the RfP together. The procedure for submitting a proposal is given in the guidelines that can be downloaded from the GEM website.

As mentioned in the response to a previous comment, the RFG do appreciate the benefit of phasing the work of the 5 global components, but would prefer them to begin together with different levels of activity within each of them for the first 6-12 months.

The idea is that the consortium will proposed standards and methods for defining vulnerability that can be applied to all types of buildings (which ideally will be carried out by the Regional Programmes), but that they themselves will only apply them to specific types at a global scale to allow initial global risk maps to be produced. With time these risk estimates will be improved as the Regional Programmes define more refined estimations of vulnerability. This will be made clearer in the proposal.

Submitted by James Daniell, PUBLISHED

Real-time or scenario based, otherwise good RfP

I agree with Dina D'Ayala and also have concerns with the no. of funded projects. The second comment comes with the real-time or scenario-based calculation of effects. The RfP is not explicit in defining a real-time socio-economic loss estimate vs. a scenario-based model via vulnerability estimation methods.

The RFG does not fully understand these comments, but can state that the focus of GEM is not on real-time loss estimation.

Submitted by Jochen Schwarz and Syed Tariq Maqsood, PUBLISHED

1) yes

2) yes

3) no

4) very useful.

5) quite likely

Preamble

Intensity has to be specified: "Intensity of ground motion" or macroseismic intensity. We prefer the use of the European Macroseismic Scale-1998 (EMS-98) because of its inherent system and demands: - Identify the pre-dominant building types - Assign the range of vulnerability classes (probable and less probable ranges, or exceptional cases) - Adopt and refine the proposed vulnerability table by local/ regional building types - Introduce a unified classification system of damage grades (for the predominant building types (extending both existing ones for Masonry and RC Structures in EMS-98) enabling the

interpretation of damaging earthquakes and the available historical data, and unifying the prognosis of the risk model at different levels or scales (macro, meso, micro).

The problem to link/ combine or convert empirical and analytical vulnerability estimations (as well as scenarios) seems to be underestimated. This is also true for the comparison of analytical damage prediction (in form of capacity curves) enabling the evaluation of observed damage (single building).

TASK 1 Guidance for a unified vulnerability assessment is given in EMS-98. However, 'varying levels of detail' should be elaborated and should be related to the elaboration of data in Tier 2.

TASK 2 Global vulnerability estimation requires a regionalization scheme. There should be different levels of elaboration in the scheme which should be developed as a separate topic. (Regional programs are unclear.) Vulnerability estimation cannot be calculated exactly, empirical vulnerability has a scatter and related to many buildings of same type and includes damaged as well as undamaged buildings. Global consequence database makes not sure if damaged and undamaged buildings both are included. The meaningful correlation between empirical and analytical vulnerability assessment is still unsolved (see Preamble; an additional Task is recommended)

TASK 3 More than 3 case study areas should be chosen depending upon two requirements. 1) Model sites for the whole regional area and 2) Model sites for larger/mega cities to ensure extrapolation of the model. Test and models sites are requested to ensure the geo-statistical extrapolation (see Tier 2). Criteria for the selection of the case study areas should be clarified; it should be distinguished between case studies where damage data (at micro or meso scale) is available to validate the outcomes, and those where an "academic" approach is intended to evaluate the reliability and correspondence among the foreseen approaches.

TASK 4 This is breaking down of information from the global vulnerability to regional/local vulnerability. EMS-98 provides a concept to address these uncertainties by assigning a range of vulnerability classes, which is linked to observed damages from the previous earthquakes (mainly contributed from the German Taskforce for Earthquakes). It is quite necessary for the whole procedure to choose some test areas where vulnerability is tested not so far from earthquake epicenter to calibrate the model. The reinterpretation of damage data and the behavior of the affected building types mostly suffers from the lack of strong-motion data at the particular sites. This problem cannot be solved by using conventional, logic-tree or other Hazard assessments. It touches quite more the appropriateness of ground motion prediction equations and local site amplification phenomena. Such damaging contributing effects have to be identified (to scale the vulnerability to reference conditions), minimizing the scatter of vulnerability assignments.

PROJECT MANAGEMENT PLAN This is a question to train qualified people; institution and courses are to be checked where training is provided. Because this matter cannot be solved in GEM alone (as low budget for global level), there should be a continuous network of education ensuring the network of qualified engineers which might take as an outcome of GEM, the responsibility of further detailing and refinement.

The O&T consortium will deal, together with the vulnerability consortium, with the issues of taxonomy and standard damage scales; this will be clarified in the additional Risk RfP document.

The term "varying levels of detail" will be clarified further. The need for comparison of analytical and empirical vulnerability estimation methods (using also the Global Earthquake Consequences Database) has already been mentioned in the RfP and will be added a separate task.

The number of sites to be studied by the consortium is only a recommendation; at present only three were suggested in order to be in line with the Inventory Data Capture Tools RfP, but it will be mentioned that the consideration of more sites would be beneficial.

Submitted by Dominik Lang on behalf of NORSAR, PUBLISHED

- 1) no (particularly for Task 2 and Task 3)
- 2) yes
- 3) no
- 4) very useful
- 5) quite likely

Specific comments: The call repeatedly mentions conduction of vulnerability assessments both on the global (Task 2) and on detailed (Task 3) levels. However, this will require sufficient information about the global hazard, which is a Project in its own right. The purpose of this Project should be limited to the development of vulnerability assessment procedures and, more importantly, development of vulnerability functions for all the building typologies included in the 'GEM Ontology and Taxonomy' in formats that are compatible with all the vulnerability assessment procedures. Once these two items are in place, one can easily conduct the vulnerability assessment for a region given the hazard. Further, the call to address 'secondary hazards' such as tsunamis is, of course, desirable, however, not realistic and would (according to our opinion) go beyond the scope of this project. More stress should be laid on the prediction of non-structural damage as the connected (economic) losses can by far exceed those losses caused by structural damage. With regard to the question whether an 'empirical' or 'analytical' approach should be followed, the call should be even stating that it will be mandatory that the chosen consortium will not only address both approaches but also includes both in the final project product (i.e. software, procedure or methodology). The project should even address constraints and options of both approaches, i.e. the application of both approaches will have their advantages and disadvantages depending on, e.g. the quality of available input information, the extent/scale of the test bed.

The RFG does not follow the argument that the hazard needs to be defined in order to calculate the vulnerability. It is clear that there will need to be an interaction with the Ground Motion Prediction Equation consortium from the hazard global components to ensure that the intensity measures of interest for damage assessment will be available, but the actual levels of hazard are not necessary.

The RFG agrees that extending to secondary hazards is ambitious, but would like to leave this option within the proposal as it may come through in-kind contribution from the bidding consortium.

The RFG will further stress the need for non-structural damage to be considered and will make it clear that both empirical and analytical approaches must be covered by the consortium.

Comments on Inventory Data Capture Tools

Submitted by Stuart Gill, PUBLISHED

1) to a high degree yes - please see my comments below.

2) yes

3) yes

4) very useful

5) Not likely

General Notes

First, I am glad to read in this proposal GEMs serious commitment to create tools rather than simply focusing on a static picture of exposure that is outdated as soon as it is finished. This RFP presents an opportunity to collect the best practices in data capture and create a flexible and powerful tool kit. Considering the abundance of tools that (to varying degrees) meet the requirements of this RFP I believe preference should be given to proposals that leverage and support already existing open source solutions to these challenges. Further that all tools created shall be open source and use existing open standards. All tools shall also be multi scale, i.e. be useful for developing proxies and useful for developing building by building data. Moreover the interface shall allow the user to move between multiple scales of detail. Within Task 1; RFPs should directly address the use of automatic feature extraction alongside human assisted creation of vector data upon the imagery. Within Task 2; more guidance is needed when you say 'crowd data collection' please provide examples to assist in clarification i.e. openstreetmap (<http://www.openstreetmap.org/>) and mapmaker (<http://www.google.com/mapmaker>). The RFPs shall also consider the appropriate workflows for the integration of crowd collected data with the appropriate verification and validation of the specific data. The tools shall be flexible to accommodate both a controlled groups and less structured more ad hoc collection of data by citizens. Due to the practical nature of this activity more emphasis should be placed on Task 4.2. The tools created in this activity shall be developed iteratively allowing for extensive user testing to optimize their function and applicability within the field. All tools developed shall be extensively tested in the field and assessed for their usability.

The RFG fully agree to improve the RfP based on these suggestions, though it is noted that references to 'crowd data collection' have been moved from the Inventory Data Capture Tools RfP to the Exposure Database RfP (as such tools should not really be developed but rather existing tools should be leveraged as suggested in this comment).