



RESEARCH AND INNOVATION ACTION, CALL WATER2B



Horizon 2020 Societal challenge 5:
Climate action, environment, resource
efficiency and raw materials

G.A. n 689669

WP3 - Subcontracting about *Visualization* – Annex 1

Core requirements

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03-Jun-2019	M. Staiano	Revision of the document against requests from the coordinator (ver. 1.1)
30-Jun-2019	M. Staiano	Incorporation of suggestions from R. Nebot and G. Acampora (ver. 1.2)
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List of acronyms

DMP Data Management Plan

G.A. Grant Agreement

ITC Instituto Tecnológico de Canarias (project partner based at Las Palmas de Gran Canaria, Spain)

JRC Joint Research Center (project partner based at Ispra, Italy)

MuSIASEM Multi Scale Integrated Analysis of Societal and Ecosystem Metabolism

NIS Nexus Information System

QST Quantitative Story-Telling

UAB Universitat Autònoma de Barcelona (project partner based at Cerdanyola del Valles, Spain)

UniNA University of Napoli Federico II (the project partner leading the present subcontracting)

UT University of Twente (project partner based at Enschede, The Netherlands)

WU Wageningen University (project partner based at Wageningen, The Netherlands)

and others from DMP.

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1. Motivation

Project executive summary [from the website www.magic-nexus.eu - emphasis added]

The MAGIC-NEXUS Project

Finding new ways to tackle complex policy issues at the nexus between water, energy and food resource.

The project “Moving Towards Adaptive Governance in Complexity: Informing Nexus Security” (MAGIC) is a four-year project funded under the H2020-WATER-2015-two-stage programme; topic “Integrated approaches to food security, low-carbon energy, sustainable water management and climate change mitigation” (WATER-2b-2015).

In the third millennium, the shift from an “empty world” to a “full and globalized world” is reaching its maximum speed and this generates new challenges for the governance of sustainability. Conventional solutions such as re-adjusting the mix of production factors – substituting a less limited resource to compensate for a shortage of another, or externalization of the problem to someone else by taking full advantage of presently favorable terms of trade, may become unsustainable in the long run.

Implementing policies involving the Nexus between water, food, energy and land use calls for an urgent overhaul of the existing theoretic and analytic tool-kits.

The goal of MAGIC is to transform Nexus from a shorthand to signify the complexity of the relationship between water, soils energy and climate into a set of relationship over identified factors which can be systematically used to explore this complexity. This implies integrating into the analysis social challenges and stakeholders perceptions related to the climate-water-food-energy nexus. Dialogue spaces will be opened, dissemination strategies enacted and mixed qualitative-quantitative tools developed in the context of a community building exercise transcending mechanistic scientist-policy maker separation but taking full advantage of the rich spectrum of actors and institutions active in the Nexus. Under the coordination of the Autonomous University of Barcelona, the MAGIC project will pursue the above-mentioned strategy with the following concrete objectives:

- 1 **Structuring the perception (qualitative) and representation (quantitative) of the nexus using an approach called Quantitative Story-Telling**, i.e. the construction and the verification of the narratives used to study and assess the nexus.
- 2 Carrying-out in the context of EU policies relevant to the Nexus: (i) a **diagnosis of the state-of-the play** – where are we now?; (ii) a **simulation of the options space** – where could we go from here?
- 3 To create and maintain a Nexus Dialogue Space considered as an essential infrastructure for the definition, operationalization and governance of the Nexus. A good example of what can be achieved by open consultation concerns the case of GMO.
- 4 To create a **Nexus Information Space (NIS)**. The NIS is a **geo-referenced visualization tool embedding the complex information related to the Nexus**. It makes it possible to establish a connection between the different metrics used to storage data about water, food, agriculture, energy or climate, among others.
- 5 To carry out a quality check on policy narratives referring to the nexus. **Quantitative Story-Telling uses the results** expected by the chosen policy to check whether these results are **feasible, viable** and **desirable** in relation to the nexus.

- 6 To carry out a quality check on the process of assessment of innovations referring to the nexus. Also in this case, the **QST will be applied to check the feasibility, viability and desirability** in relation to the nexus of a large scale application **of innovations**. Here different **case studies** will be used in relation to five innovations relevant for the nexus: (i) **biofuel** production, (ii) **fracking**, (iii) **GMOs**, (iv) **tradable permits**, and (v) **desalination**.
- 7 To create a Nexus Knowledge Hub for enhancing the dissemination of the results and guaranteeing a long lasting legacy to the results of the project.

The **need for a subcontracting** [From the G.A. 689669, Part B page 60 of 92]

At the time of the call a subcontracting has been specifically motivated in the proposal and is included into the Grant Agreement:

There are 3 subcontracting in the project:
1) in the budget of EC-JRC – 100,000 € over the 4 years - for the participatory processes and other activity of interaction with the society in the Nexus Dialogue Space;
2) in the budget of UNINA – 18,000 € over the 4 years – for the development of visualization and decision support tools;
3) in the budget of UAB – 18,000 € over the 4 years – for the development and the operation of the interactive website.

University of Napoli Federico II (UNINA)	
<i>Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)?</i>	Yes
<i>If yes, please describe and justify the tasks to be subcontracted:</i>	
Task: <u>Assembling the visualization tool</u>:	
<ul style="list-style-type: none"> ➤ The visualization tool inside the DSS envisioned in MAGIC aims at introducing the QST approach to a wide range of actors (scientist, policy makers, stakeholders with different core interests and views). ➤ At successive stages it is expected to give the ground basis for the final communication to general public. Therefore the suite of required tools is heterogeneous (it spans from summary tables to interactive graphs and maps suitably arranged in tailored dashboards as long as synoptic infographics and is expected to be issued in a multiplatform browser environment). ➤ This could be effectively accomplished with a subcontractor operating with a mixed team of graphical designers and software and web specialists integrating good statistical skills working on specifications, design and final tests defined by UNINA. 	

2. Context

Quantitative analyses in MAGIC

The MAGIC project aims at supplying a novel perspective on the nexus, enabling decision makers, stakeholders, institutions and organizations, as well as conscious citizens and grass-root movements, to achieve insights on the relevant issues and interact to discuss solutions.

The complexity of nexus, a multifaceted concept itself, poses challenges on multiple aspects: how to promote a common understanding of urgent issues;

how to formalize and quantify their relevant aspects in a transparent manner;

how to sustain participatory processes toward consensus about the strategies to cope with them.

The ways each of the above challenges are faced in the approach shared by the partners of the project are:

eliciting current narratives about issues as well as currently proposed solutions;

designing multi-purpose grammars, specializing them on specific case studies and gathering data;

presenting the grammars and the resulting quantifications in a clear and engaging manner.

These processes are envisioned as steps in iterative cycles of Quantitative Story Telling, see Figure 1 and Figure 2 below.

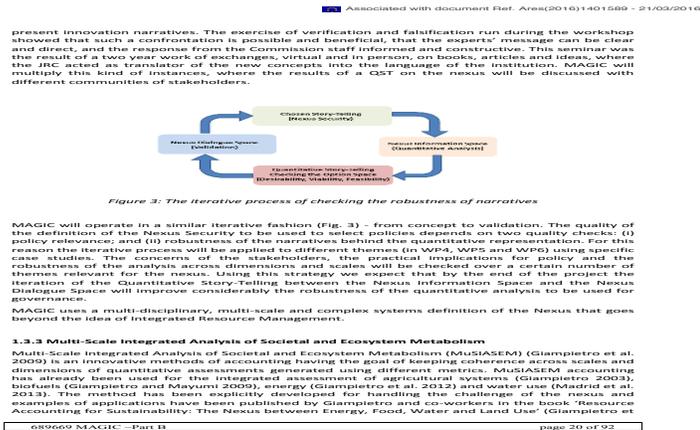
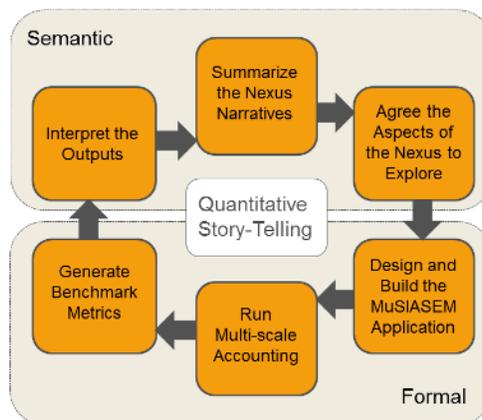


Figure 1: The iterative process of checking the robustness of narratives



The quantitative analyses are in the scope of the so called MAGIC *Nexus Information System*, NIS – in the responsibility of UniNA, and are framed as case studies. After an early stage of pilot case studies

(released under WP4, lead by UAB), used to share the approaches, test the tools and tune the collaborative work plans, the core packages WP5 and WP6 (led by WU and Hutton partners, respectively)

Implementing the SLIM methodology

The flow of processes that allows to lift data from information to knowledge, so to exploit the value at the decision making stage, has been explained by UniNA on a document called *SLIM: Statistical Learning & Information Management* and shared with the whole consortium during the first year of the project. the SLIM methodology is inspired to the principle of *Total Quality Management of Plan-Do-Check-Act*, and exemplifies how each step in the process of Knowledge extraction is bound to those phases (see Figure 3).

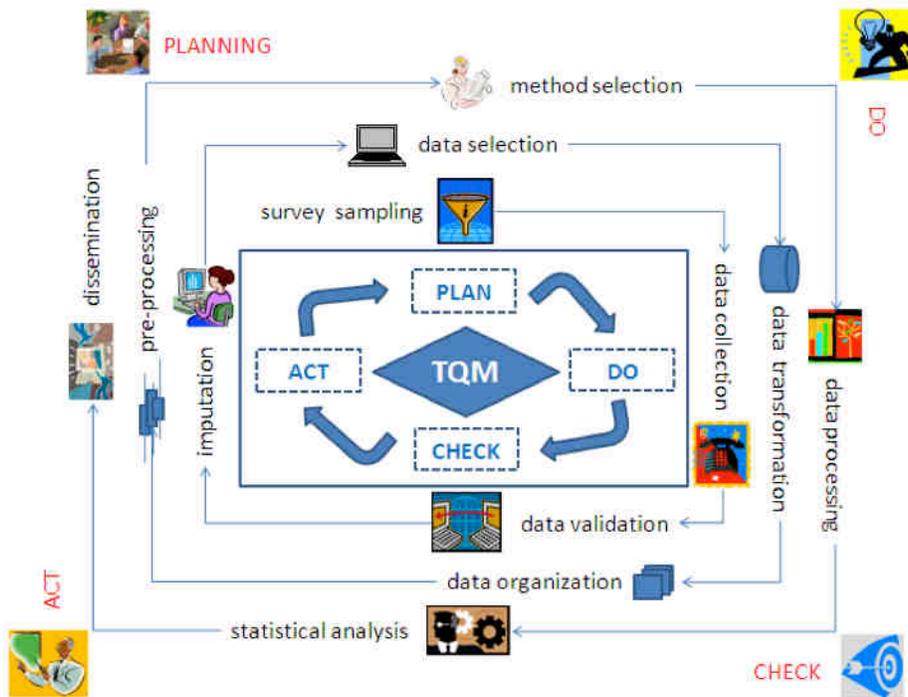


Figure 3: processes in the SLIM approach and their relation to Plan-Do-Check-Act phases

Visualization in the MAGIC project

The set of visualization tools required for presentation and dissemination of results is variegated, being addressed to a broad and diversified audience. It spans from simple (static) infographics to complete customizable dashboards for *visual analytics* suitable to In order to spark the impact of dissemination of the MAGIC project results, its scope has been expanded to include an educational game to be consumed online (in the form of a web app, suitable for desktop computer and mobile devices) as well as brief videos; both tools are supposed to foster the engagement of the stakeholders about nexus issues and could be used in the setting of participatory activities designed in the scope of a so called Nexus Dialogue Space.

The is undergoing and UniNA is interacting with project partners that are working out QST about policy narratives and six innovation themes. A basic set of visualizations has been already exploited for the delivering of some project outputs, and is available from the project website in the Knowledge Hub section (<http://www.magic-nexus.eu/knowledge-hub>).

In the following a list of resources useful to look at sample material about the visualization that supplement the list on the website page: <http://magic-nexus.eu/visualization-methods>

- 1) the policy briefs delivered so far uploaded in the Knowledge Hub > Document Repository section:
<http://magic-nexus.eu/documents-repository> (e.g. about Common Agricultural Policy):
magic-nexus.eu/sites/default/files/files_documents_repository/magic_policy_agriculture_19.05.09.pdf
- 2) IPCC summary for policy makers about Climate Change related actions:
https://www.ipcc.ch/site/assets/uploads/sites/2/2019/05/SR15_SPM_version_report_LR.pdf
- 3) simulation game for the exemplification of nexus issues: <http://beta.thesustainabilitysudoku.info>
- 4) short video on specific nexus aspects: <https://www.youtube.com/watch?v=PXf4KVWyfs>

Logical flow: how to move from quantification to QST

Project partners are committed to address a set of case studies about relevant themes in the nexus: the related work is organized in three out of the seven project work packages. The agreed plan is to deliver about 6 innovation themes. Results in WP4 has been already released as a guide for the development of the other case studies.

All the public material is accessible at the project website, in the sections of the Knowledge Hub (<http://www.magic-nexus.eu/knowledge-hub>).

In the NIS repository perspective, a *case study* is a:

Combination of **processor network** (see the *class hierarchy* in the NIS backend ORM and the basic ontology that the frontend allow to download), **data sources** (*tables* – or cubes in general – and *mappings*) and **user views** (*indicators*, *graphs* and complete *dashboards*).

The data flow: which NIS tools are already in place

The set of components currently made available in the Nexus Information Space are:

A NextCloud instance for the project internal data repository, accessible with personal credentials:

<https://nextcloud.data.magic-nexus.eu/login>

A Geonetwork node, for handling geographical data and metadata, accessible here:

<https://gn.data.magic-nexus.eu/>

A Jupyter lab and hub instance for data science (Python and R), accessible with personal credentials:

<https://jupyter.data.magic-nexus.eu/hub/login>

A backend (written in Python) capable of elaborating case study prepared according to the prescribed format and made accessible via RESTful APIs as well as an experimental frontend (based on Angular):

https://one.nis.magic-nexus.eu/nis_client/

An instance of TAIGA, for internal management of the development of NIS source code:

<https://taiga.nis.magic-nexus.eu/>

Operationalizing custom dashboards for use in the dialogue space

Custom dashboards are expected to be made available for engagement of stakeholders in one-to-one interviews or in focus group events, as well as for autonomous consumption; therefore they should be accessible over Internet (by registered users) on the project website, in which are to be coherently integrated in the form of web apps.

What has been envisioned at the time of the proposal (useful to show the multiple actors setting):

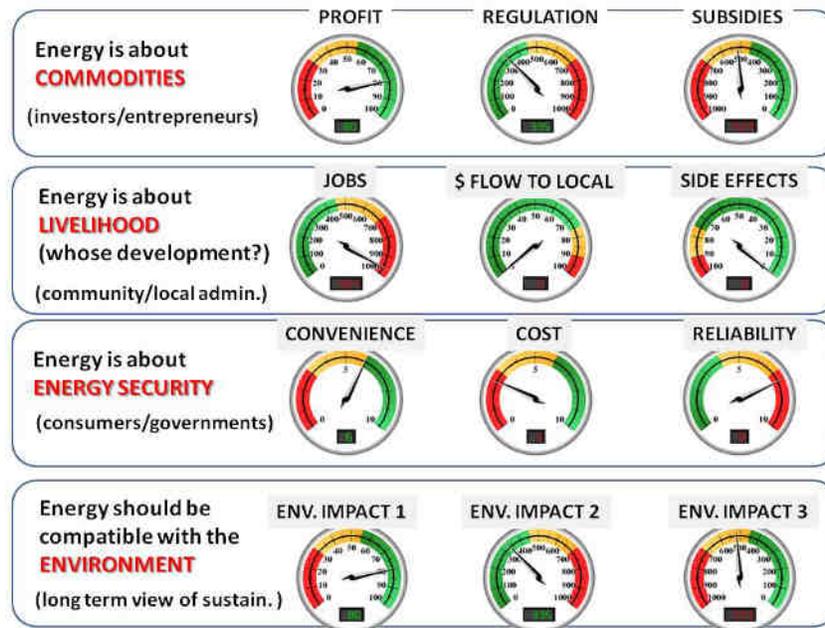


Figure 4: Examples of indicators used within the Quantitative Story-Telling Approach (the dashboards can have different forms depending on the chosen indicators)

What is currently understood as the complex set of information to be displayed via dashboards:

QST informed by MuSIASEM analyses represents a step forward in sustainability analysis integrating different framings of sustainability issues across different scales and dimensions of analysis. The MuSIASEM accounting framework is not based on conventional mathematical models, but integrates non-equivalent metrics, thus making it possible to combine four different cross-scale perspectives (or *level of analysis*):

- **Macroscopic** – studying the Consumption and Supply systems -describing their desirability at the equivalent of a macroeconomic level of analysis;
- **Mesoscopic** – studying the Supply systems (local vs. externalized) - describing the role of imports in allowing the metabolic pattern of a society to persist by drawing in resources and externalizing negative environmental impacts;
- **Microscopic** – studying the Production and Sequential Pathway systems - analyzing how the magnitude and ways in which production is undertaken (in biophysical terms within the technosphere) and how this interacts with natural processes (locally within the biosphere) to generate environmental pressures and impact;
- **“Virtualscopic”** - studying the requirements of economic production factors (labour and technologies), primary sources (for the supply of inputs), and primary sinks (for the disposal of undesired wastes) – i.e. level of externalized impact – that a society is generating because of its terms of trade. This perspective is essential to discuss ethical and security aspects of heavily relying on imports.

A best in class example:

A reference **multitab dashboard**: <https://delta87.org/dashboards/argentina/>

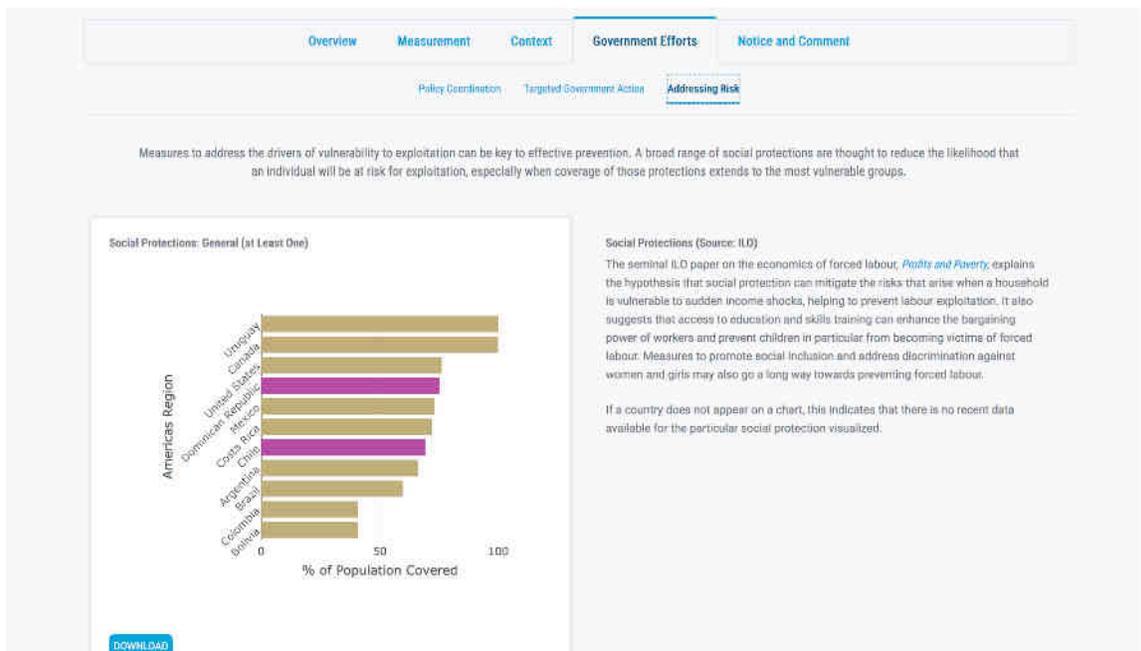
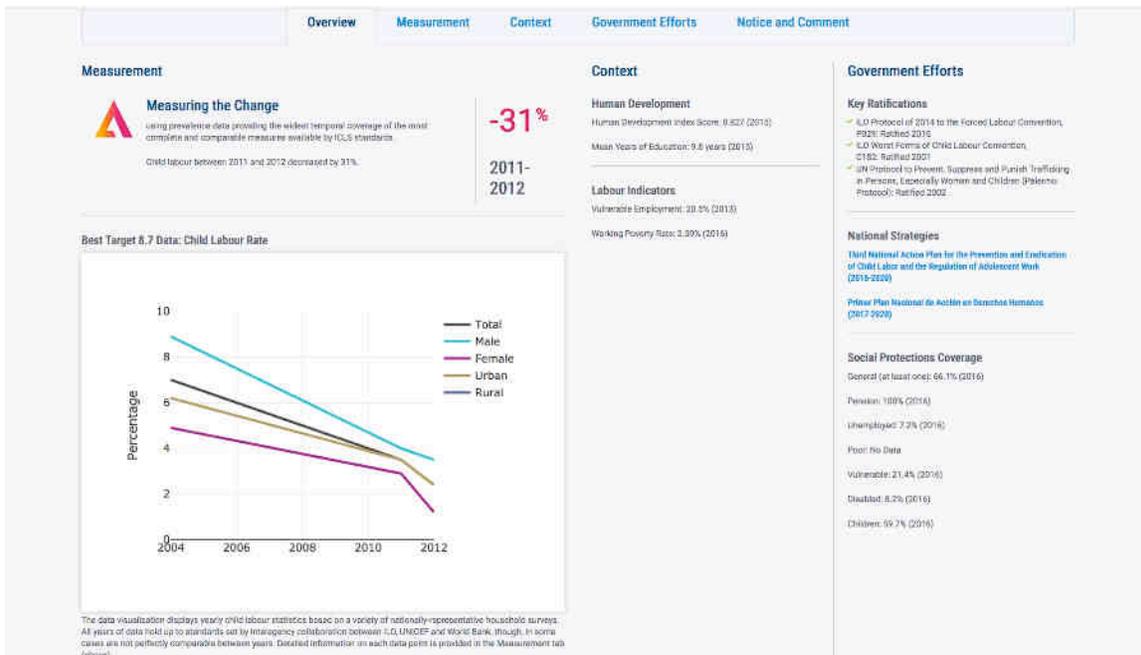


Figure 5: Multiple tabs of a specimen dashboard

3. Expected output (operationalizing QST in a visual fashion)

The expected output (detailed in the Annex2 about Design specification) consists of the five assets in the following table:

Table 1: Assets of the expected output of the subcontracting

a) An educational game;
b) Key visualizations into the MAGIC website;
c) Online dashboards for Quantitative Story-Telling;
d) GUI to an interactive system for analyses by stakeholders;
e) Support for the production of short videos.

4. Implementation

Aims, contents and guidelines

Expected phases of the work

- Singling out the kind of expected outputs (infographics for web/policy brief/ newsletter; custom graph types for the visualization of results; interactive dashboards for the dissemination of QST);
- Analysis of various concepts and candidate selection for the components and the dashboard;
- Releasing a prototype of the dashboard;
- Testing (supervised by UniNA);
- Integration in the NIS and website, on-line deployment and assistance for the interface to new data for live *visual analytics* (through *adapters* and *backend scripts*);
- Interfacing with the Knowledge Hub;
- Contribution to the development of an Educational Nexus Game web-app;
- Support in the release of short informative videos about specific nexus themes.

These phases are not in consecutive but at some degree concurrent: given the project milestones and deadlines, UniNA and the management of the subcontractor are expected to discuss a suitable workflow arranged in *sprints* as in the Agile framework and detail the work plan in the contract.

Constraints (applicable rules and practices)

Subcontractors do not have any IPR rights on the foreground of the project; the subcontracted parts should in principle not be "core" parts of the project work; subcontracts do not concern the research work itself, but tasks or activities needed in order to carry out the research, auxiliary to the main object of the project; the beneficiary remains responsible for all its rights and obligations under the GA, including the tasks carried out by a subcontractor.

The beneficiary must ensure that the intellectual property that may be generated by a subcontractor reverts to the beneficiary so that it can meet its obligations towards the other beneficiaries in the GA. Any bilateral agreement between subcontractor and beneficiary should include this, as well as the respect of the obligations mentioned in the relevant articles of the GA which concern, among others, IP obligations related to protection of foreground, dissemination, information and communication of project results and data and obligations in terms of financial audits and controls.

"Any subcontract, the costs of which are to be claimed as an eligible cost, must be awarded to the bid offering best value for money (best price-quality ratio), under conditions of transparency and equal treatment."

The procedure to be applied for the award of subcontracts depends on the status of the beneficiary: ✎ public entities must follow the procurement principles established by their national authorities in compliance with the EU public procurement rules. For subcontracts awarded by public bodies exceeding certain amounts, the directives on public procurement of services and works and the national procurement rules shall apply and the publication of a call for tenders shall be mandatory. However, in the case the amount of the subcontract is set below the applicable procurement threshold, the beneficiary should nevertheless comply with the terms of the G.A.

Example:

In a project, a beneficiary (university) subcontracts task X for an amount of EUR 50,000. If this amount is below the threshold set by the national public procurement rules, the beneficiary shall anyway comply with the rules on subcontracting set out in the GA even if the national rules do not set out any specific requirement.

The procedure must ensure conditions of transparency and equal treatment. At the request of the CSJU and especially in the event of an audit, beneficiaries must be able to demonstrate that the subcontract was awarded to the bid offering best value for money (best price-quality ratio), under the conditions of transparency and equal treatment. This demonstration includes full access to procurement related documentation by auditors

Beneficiaries must be able to prove that:

the criteria and conditions of submission and selection are clear and identical for any legal entity offering a bid;

there is no conflict of interest in the selection of the offers;

the selection must be based on the best value for money given the quality of the service proposed (best price-quality ratio). It is not necessary to select the lowest price, though price is an essential aspect.

The criteria defining "quality" must be clear and coherent according to the purpose of the task to subcontract, in order to provide a good analysis of the ratio price/quality.

Support role in the visualization/implementation for the Nexus Game

It is expected that subcontractors have a role in the deployment of an educational game, envisioned in the WP7 of MAGIC project.

The development of an Educational Nexus Game is in the direct responsibility of the partner UT, with support from both UAB and UNINA.

UT is developing a game with an educational character that provides the player an understanding of how changes in production systems and consumption patterns affect internal resource use and external dependency, focusing on the water-land-food-energy nexus. The target audience is people with an interest or stake in policy development in the nexus domain without in-depth prior knowledge to the interactions in the nexus (e.g. EU policy makers, MSc and BSc level students). To this end, the game will convey the main trade-offs and synergies in the nexus using a quantitative framework of simple (linear) relations between the nexus elements rather than a full MuSIASEM approach. The game will be designed as a one-player game in Excel format (the output that UT will release) and implemented in an online tool or mobile application (in the scope of the present subcontracting, lead by UNINA) to be disseminated via the MAGIC website (managed by UAB, with the technical support from JRC that administered the related subcontracting), and made available also after the end of the project. In addition, UT will address a *roleplay* version of the game that uses the tool and can be played in a real-life setting with multiple players for collaborative learning: UT will have the lead and develop the game. UAB will have an advisory role and will be involved in the testing of the game. UNINA will support the embedding of the game online, building on same technologies and the experience gained by the development of custom dashboards and other visualization tools for QST.

Support role in the realization of short videos

It is expected that subcontractors have a role also in the realization of short informative videos, envisioned in the WP7 of MAGIC project.

The preparation of the video material falls in the responsibility of project partners and only limited technical support is required from the subcontractor to finalize the videos and publish in the project website.

Reference material

1. DMP implementation - part 1 (presentation held by M. Staiano during the webinar on December 2016)
2. DMP implementation - part 2 - practical considerations and example (presentation held by R. Nebot during the webinar on December 2016)
3. Stad Group, UniNA, SLIM approach for MAGIC – guidelines for Data repository and datasets handling (MAGIC internal report, July 2017, available [here](#))
4. MAGIC - NIS - Standardizing case study representation (presentation held by R. Nebot on October 2017)
5. Tutorial and videos available in the Tutorial folder (under WP3) shared on the MAGIC Google drive.

Please consider the environment before printing.