

AQUASTAT – FAO’s Global Water Information System

Guidelines for the AQUASTAT Programme

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<\\...\\AQUASTAT\\AQUASTAT General\\Guidelines for AQUASTAT>

(see section 10.1 for information on complete link)

1. Main Database: explanation of the Working System dropdown menus.....	5
1.1. The “AQUASTAT Working System” dropdown menu for administrators and editors.....	5
1.1.1. Database Query/Edit.....	5
1.1.2. Institutions.....	6
1.1.3. Glossary.....	6
1.1.4. Upload questionnaire	7
1.1.5. Upload CSV.....	7
1.1.6. Source References	7
1.1.7. Journal History	7
1.1.8. Saved Query.....	7
1.1.9. Country Fact Sheets	8
1.1.10. Water Resources Sheets Notes.....	8
1.1.11. Water Resources Sheets	9
1.1.12. Irrigation Sheets.....	9
1.1.13. Metadata Query/Edit/Add.....	9
1.1.14. Dissemination Query Page.....	10
1.2. The “Administrative Tools” dropdown menu for administrators only	10
1.2.1. World Regions.....	10
1.2.2. Countries & Provinces.....	10
1.2.3. Variables	11
1.2.4. Calculation Rules.....	11
1.2.5. Validation Rules	11



1.2.6. Users	11
1.2.7. Publish to the dissemination system	11
2. Main Database: variables and indicators	13
2.1. Creation of a new variable, calculation rule, validation rule and definition	13
2.1.1. Creation of a new variable	13
2.1.2. Creation of a calculation rule.....	13
2.1.3. Creation of a validation rule	13
2.1.4. Creation of the definition of the variable in the glossary.....	14
2.2. List of variables and indicators	14
2.3. List of calculation rules	21
2.4. List of validation rules.....	23
2.5. AQUASTAT variables: categorization combining of three criteria.....	26
2.5.1. Categorization of all variables and indicators.....	27
2.5.2. Quantity of variables and indicators by sub-category and detailed legend	32
2.5.3. Summary with quantities by category	32
3. Other tasks directly related to the Main Database.....	33
3.1. Uploading data and metadata	33
3.1.1. Use of the edit screen.....	33
3.1.2. Use of the CSV-Maker for uploading data and metadata.....	33
3.1.3. Monitoring data and metadata actions	35
3.1.4. Monthly database reports	35
3.2. Uploading metadata	35
3.2.1. Procedure for inserting, updating, deleting many metadata	35
3.2.2. Procedure for deleting, inserting, updating metadata one by one	36
3.3. Updating wastewater data	36
3.4. Preparation of a parametrized search	37
3.4.1. Preparation of a parametrized search for database variables	37
3.4.2. Preparation of a parametrized search for glossary terms by subject.....	38
3.5. AQUASTAT and FAOSTAT (ESS).....	38
3.5.1. Irrigation-related variables in AQUASTAT and FAOSTAT	38
3.5.2. Water-related variables in FAOSTAT taken from AQUASTAT	39
3.5.3. Land- and population-related variables in AQUASTAT taken form FAOSTAT	40
3.6. AQUASTAT and the Information Technology Division (CIO).....	40
4. Country update	47
4.1. Updating a country	47
4.1.1. Information from the national expert	47
4.1.2. Questionnaire	48



4.1.3.	Country profile.....	48
4.1.4.	Country tables.....	49
4.1.5.	Country figures	49
4.1.6.	Water resources sheet.....	50
4.1.7.	Dams	50
4.1.8.	Irrigated crop calendar	51
4.1.9.	Detailed country map	51
4.1.10.	Decisions and checks	51
4.1.11.	Comparison table.....	51
4.1.12.	Sources.....	51
4.1.13.	Update the Global Map of Irrigation Areas (GMIA).....	51
4.1.14.	Update water withdrawal.....	52
4.1.15.	HTML.....	52
4.2.	Updating an online country profile.....	52
4.3.	Storage of references/sources.....	53
4.4.	Preparation of detailed country maps.....	56
4.4.1.	Information collected for the GIS expert to be able to prepare the map	56
4.4.2.	Assisting the GIS expert during the preparation of the country map	58
4.4.3.	What to check when the map is done	59
4.4.4.	Resolution of the map	59
4.4.5.	Where to put the maps in the Divisional shared drive and the Website drive	59
4.5.	AQUASTAT and Eurostat and OECD countries.....	60
4.6.	Ideas for country update strategy in case of limited resources	60
4.6.1.	Introduction	60
4.6.2.	Current country update strategy	61
4.6.3.	Checking time, cost and data quality of the current country update strategy	62
4.6.4.	Access to data with regards to water and irrigation	63
4.6.5.	Updating strategy options: some, incomplete, ideas	64
4.6.6.	Selection of countries where to test the new country update strategy.....	65
4.6.7.	Other issues	66
5.	Topical updates.....	67
5.1.	Dams	67
5.1.1.	The dams global Excel file	67
5.1.2.	Notes and references document	71
5.1.3.	Monitoring dams actions	71
5.2.	The Global Map of Irrigation Areas (GMIA)	71
5.3.	Country irrigated crop calendars	72



5.3.1.	Procedure to follow for updating irrigated crop calendars	72
5.3.2.	Some assumptions	73
6.	Website issues	74
6.1.	Introductory remarks	74
6.2.	Updating the asset viewer	74
6.3.	Icons for the AQUASTAT website.....	75
6.4.	Updating of visualizations using R	77
7.	AQUASTAT and UN-Water	78
7.1.	Federated Water Monitoring System (FWMS) & Key Water Indicator Portal (KWIP).....	78
7.1.1.	What was proposed to be accomplished	78
7.1.2.	Limitations during implementation	79
7.1.3.	Lessons learned.....	80
7.2.	UN-Water Country Briefs (WCB).....	80
7.3.	The GEMI project on Monitoring SDG 6.3-6.6.....	81
7.4.	AQUASTAT collaboration with UNSD and with Eurostat	81
8.	AQUASTAT and the IDWG on Statistics, its Technical Task Force and Working Groups	83
8.1.	DG Bulletins and Administrative Circulars	83
8.2.	Inter-Departmental Working Group (IDWG) on Statistics and Technical Task Force.....	83
8.3.	The Statistical Working System.....	84
8.4.	FAO Statistical Programme of Work	85
8.5.	World Programme for the Census of Agriculture	86
9.	AQUASTAT and SDG Target 6.4	87
9.1.	AQUASTAT and FAO and SDG 6.4	87
9.2.	AQUASTAT and reporting to UNSD on MDG 7.5 and SDG 6.4.....	87
9.3.	AQUASTAT and the UN-Water GEMI Project on SDG 6.4.....	88
10.	General information about AQUASTAT	90
10.1.	AQUASTAT-related links	90
10.2.	About AQUASTAT	91
10.3.	Understanding AQUASTAT.....	91
10.4.	AQUASTAT: Looking forward	91

1. Main Database: explanation of the Working System dropdown menus

AQUASTAT internal database, the **Working System (WS)**, is located under:
<http://www.fao.org/nr/water/aquastat/work/query/index.html>

The WS can be accessed in three different ways, depending on the privileges given. For all three options an FAO account is required:

- **Anonymous FAO user:** There are no dropdown menus at the top left. The user can query the data and can get information on internal variables, internal metadata, data update history and sources.
- **Editor:** The user has access to the left dropdown menu only “AQUASTAT Working System”. This means the user can edit data in the query results page, upload institutions, create glossary terms, upload CSVs, create sources/references, and query/add/edit metadata.
- **Administrator:** The user has access to both the “AQUASTAT Working System” dropdown menu mentioned under 2 and to the “Administrative Tools” dropdown menu. This privilege should be reserved to the AQUASTAT programme manager only, to the AQUASTAT focal point in CIO and to the Statistical Working System focal point in ESS. The user can create regions, countries, variables, calculation rules, validation rules, add/block users. The administrator also can “Publish data” and “Publish PDF” to the dissemination system and generate dump files that are stored in the “Journal History” and “Report” folders of [\\hqlprtomc04.hq.un.fao.org/TC70AquastatWork_appdata_user\](http://hqlprtomc04.hq.un.fao.org/TC70AquastatWork_appdata_user/). See further below and section 10.1 for more explanations and access.

1.1. The “AQUASTAT Working System” dropdown menu for administrators and editors

1.1.1. Database Query/Edit

<http://www.fao.org/nr/water/aquastat/work/query/index.html>

Data can be uploaded/corrected/deleted one by one using the “Edit” option. The variable(s) can be chosen, the country and the period or year. In the results page, at the top right, click the “Edit” button and perform the action wanted. For calculation rules and validation rules, see section 1.2.4 and section 1.2.5. For the metadata, see section 3.2, as well as the document “Contextual metadata in the AQUASTAT database” (<http://www.fao.org/3/a-bc819e.pdf>).

An option available in the WS but not in the external Dissemination System (DS) is “Sum”. This option can be useful when selecting “Latest value”. Those types of data can be used when having to prepare a paper or providing data for speeches. However, the reason that this option is not available to external users, is that the database is not a full database, so people should realize that the sum is combining data for different years and maybe does not include all countries (in case a country has no data at all for a variable). For example the latest value of a variable can be 1987 in Angola and 2010 in Brazil. For preparing speeches it might be ok using the sum of the latest values, but external users should do these actions themselves in the downloaded Excel file after having seen what “Latest values” represents.

Also, only in the WS and not in the DS it is possible under “Select period” to do “Search by year”. In the DS one can only search by period and the value that is given is the latest value available in a period. The reason that in the DS it is only possible to search by period is that the database is rather empty and showing by year gives too many empty cells. Also, except for data under the category “Geography and population”, it does not happen often that in the same period data are available for several years.

See <http://www.fao.org/nr/water/aquastat/sets/index.stm#main> for more explanations.

1.1.2. Institutions

<http://www.fao.org/nr/water/aquastat/work/institutions/search.html>

When collecting new data using the questionnaire http://www.fao.org/nr/water/aquastat/sets/aq-5yr-quest_eng.xls, there is one sheet, the “Institutions” sheet, where it is asked to fill in water-related institutions in the country. This information is then filled in in the <http://www.fao.org/nr/water/aquastat/work/institutions/edit.html> page. The DS <http://www.fao.org/nr/water/aquastat/data/institutions/search.html> shows less information than the WS <http://www.fao.org/nr/water/aquastat/work/institutions/search.html>, where in the results page also the URL and contact person information is given, if available.

1.1.3. Glossary

<http://www.fao.org/nr/water/aquastat/work/glossary/search.html>

To create a new term and definition in the glossary, proceed as follows:

- ✓ Open the WS link <http://www.fao.org/nr/water/aquastat/work/glossary/search.html> and push the “Add New” button.
- ✓ It is not possible to fill in “Code number”. This will be automatically done.
- ✓ Give a name to the variable **IN ALL THREE** languages.
- ✓ Fill in the definitions and units in **IN ALL THREE** languages.
- ✓ If the definition comes from an already existing source, then select that source. If the definition comes from a new source, then add the source. If the definition comes from AQUASTAT or if the origin is not known, then leave the source empty.
- ✓ In the “Subject(s)” box, select the ones wanted. Keep the Ctrl button pressed if wanting to select more than one. In case the variable is also in the Main Database, then also **always** select “AQUASTAT Main Database (see section 2.1.4 for more information on this)
- ✓ Under “related terms”, click the ones that are related and interesting to see from the results page, where they then appear also as clickable links. Keep the Ctrl button pressed if wanting to select more than one.
- ✓ Put metadata, if needed. See for example the metadata for this term <http://bit.ly/2g6KcNr>. See section 2.1.4 and 3.2.1 for more explanations.
- ✓ Push the “Save” button.
- ✓ **IMPORTANT:** If a glossary term has to be created for a variable in the Main Database, then see section 2.1.4 for the procedure to follow.

1.1.4. Upload questionnaire

<http://www.fao.org/nr/water/aquastat/work/edit/qupload.html>

For the moment this function does not work. Instead uploading is done using the CSV-Maker, see section 3.1.2. The option might become available again through the SWS (see section 8.3).

1.1.5. Upload CSV

<http://www.fao.org/nr/water/aquastat/work/edit/cupload.html>

The get detailed instructions on how to use the CSV-Maker and how to upload a CSV, see section 3.1.2.

1.1.6. Source References

<http://www.fao.org/nr/water/aquastat/work/sources/search.html>

By doing a search for a country and/or keyword, it can be checked whether a source exists already in the database.

Another option to check whether a source already exists in the database, is to click on “Download Source db.csv”. Then it can be checked in the Excel/CSV file whether a certain source exists already using the “Find” option.

If a source for new data does not yet exists, then click the “Add new” button to add the new source. If a digital file of the source is available, then add it under “Choose file”. It will then be stored in the CIO sources folder (see section 4.3) and it can be opened from the Query results page of a variable, only in the WS, not in the DS. If users are interested to know what source is used for a data point, then this can be checked to be able to send a reply to the user.

1.1.7. Journal History

<http://www.fao.org/nr/water/aquastat/work/journal/history.html>

This option can be used to check quickly all data available in the database for a country. Several selection criteria are available, that can be filled in, or not, such as who uploaded the data (Username), the years, the reference, the variables. On the results page there is the possibility to download the information by clicking the “CSV Flat” button.

1.1.8. Saved Query


<http://www.fao.org/nr/water/aquastat/work/queries/select.html>


This option was created to have a direct link to the results page of that database on other websites. This option is not really used anymore, but replaced by the “Parametrized search” option, which is explained in section 3.4. The only place where the “Saved Query” option is still used is on the FAO Conservation Agriculture website <http://www.fao.org/ag/ca/6c.html>. Here the latest data available in the AQUASTAT Main Database on the variable “Conservation agriculture area” is provided,

including the year to which the variable refers as well as the sum. Whenever AQUASTAT adds and publishes new data, this table is automatically updated.

1.1.9. Country Fact Sheets

<http://www.fao.org/nr/water/aquastat/work/factsheets/index.html>

A template was developed in collaboration with CIO to show on one page in PDF format the latest information available in the database for a certain country. The PDF, that can be accessed through the country profile webpage by clicking on  left of the country location map or through the dropdown menu when selecting a country on the home page or on the “Countries, regions river basins” page, contains always the latest information available in the database.



The PDF is automatically updated when pushing the “Publish” button under the Administrative Tools dropdown menu (see section 1.2.7). The date updated is given at the bottom left of the PDF file. The PDF file exists in English, French and Spanish.

Some changes will be needed in the fact sheet and should be requested to CIO:

- ✓ FAOSTAT/ILO stopped providing data on economically active population. Therefore this information is also not provided anymore by AQUASTAT. Thus the two last lines under “Population” in the factsheet should be removed.
- ✓ Since agricultural water withdrawal refers to all water (both freshwater and non-conventional water), it is better to remove this line under “Pressure on water resources” and keep only total freshwater withdrawal. The reason is that it can happen (especially in dry Middle East countries where relatively more non-conventional water is used) that the value for Agricultural water withdrawal as % of TRWR is larger than Total freshwater withdrawal as % of TRWR. See for example the fact sheet for United Arab Emirates http://www.fao.org/nr/water/aquastat/data/cf/readPdf.html?f=ARE-CF_eng.pdf. This confuses people. The reason that for sectoral water withdrawal there is no distinction between freshwater and non-conventional is simply the lack of this disaggregated information by sector. By the way: Values of more than 100% for freshwater withdrawal as % of TRWR can be due to the use of secondary freshwater or the use of fossil groundwater or depletion of renewable groundwater, which are all three included in freshwater withdrawal (the numerator), but not in renewable freshwater resources (the denominator). The main reason again is the lack of disaggregated information. For more information, see the definitions in the glossary.


1.1.10. Water Resources Sheets Notes

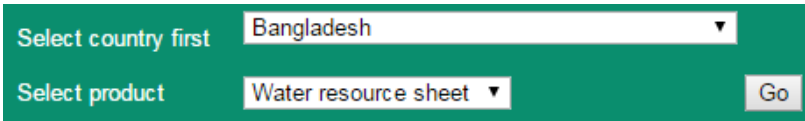
<http://www.fao.org/nr/water/aquastat/work/notes/search.html>

This option does not exist anymore, since it has been replaced by the metadata option. See section 3.2.

1.1.11. Water Resources Sheets

<http://www.fao.org/nr/water/aquastat/work/wbsheets/index.html>

Similar to the country fact sheets described in section 1.1.9, a template was developed in collaboration with CIO to show on one page in PDF format the information available in the database on water resources for a certain country. The PDF, that can be accessed through the country profile page by clicking on  left of the country location map or through the dropdown menu when selecting a country on the home page or on the “Countries, regions river basins” page, contains always the latest information available in the database.




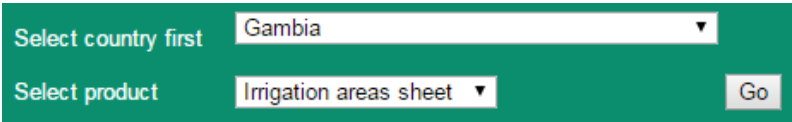
The PDF is automatically updated when pushing the “Publish” button under the Administrative Tools dropdown menu (see section 1.2.7). The date updated is given at the bottom left of the PDF file. The PDF file exists in English, French and Spanish.

A special feature of this page is that it shows the metadata. These are the metadata in the Main Database that are indicated as “P”, meaning being visible in the DS (see section 3.2). This replaces the notes that previously had to be prepared separately under section 1.1.10 at the time when the metadata option in the database did not yet exist.

1.1.12. Irrigation Sheets

<http://www.fao.org/nr/water/aquastat/work/irrigationsheets/index.html>

Similar to the country fact sheets described in section 1.1.9 and the water resources sheets described in section 1.1.11, a template was developed in collaboration with CIO to show on one page in PDF format the latest information available in the database on irrigation areas and typology for a certain country. The PDF, that can be accessed through the country profile page by clicking on  left of the country location map or through the dropdown menu when selecting a country on the home page or on the “Countries, regions river basins” page, contains always the latest information available in the database.



The PDF is automatically updated when pushing the “Publish” button under the Administrative Tools dropdown menu (see section 1.2.7). The date updated is given at the bottom left of the PDF file. The PDF file exists in English, French and Spanish.

1.1.13. Metadata Query/Edit/Add

<http://www.fao.org/nr/water/aquastat/work/metadata/addMetadata.html>

This option is described in detail in (i) section 1.1.1, (ii) section 3.2 and (iii) the “Contextual metadata in the AQUASTAT database” working paper (<http://www.fao.org/3/a-bc819e.pdf>).

1.1.14. Dissemination Query Page

<http://www.fao.org/nr/water/aquastat/data/query/index.html>

Selecting this option goes to the database in DS.

1.2. The “Administrative Tools” dropdown menu for administrators only

1.2.1. World Regions

<http://www.fao.org/nr/water/aquastat/work/regions/select.html>

FAO (Sub)Regional Offices
 FAO-RAF (Africa)
 FAO-SFE (Eastern Africa)
 FAO-SFS (Southern Africa)
 FAO-SFW (Western Africa)
 FAO-SFC (Central Africa)
 FAO-RNE (Near East & N. Africa)
 FAO-SNE (North Africa)
 FAO-RNE Other countries
 FAO-RAP (Asia & the Pacific)
 FAO-SAP (Pacific Islands)
 FAO-RAP Other countries
 FAO-REU (Europe & Central Asia)
 FAO-SEU (Cent & East Europe)
 FAO-SEC (Central Asia)
 FAO-REU Other countries
 FAO-RLC (Latin America & Car.)
 FAO-SLC (Caribbean)
 FAO-SLM (Central America)
 FAO-RLC Other countries
 UN Economic Organizations
 UN-ECA (Africa)
 UN-ESCAP (Asia & the Pacific)
 UN-ESCWA (West Asia)
 UN-ECE (Europe)
 UN-ECLAC (Latin America & Car.)

Using this option, regions can be created and it can be decided whether a region is external or internal by ticking yes (DS) or no (WS) the “Disseminate” box on the newly created region <http://www.fao.org/nr/water/aquastat/work/regions/edit.html>.

Several sub-regions can be created under a region, see for example the sub-regions under the FAO regional offices or under the UN Economic Organizations.

The region can be selected on the Query page by selecting “Search by Region” under “Select Countries”. And while in the WS it is possible to select “Sum”, this is not possible in the DS for the same reasons as explained in section 1.1.1. Also in the WS it is possible to not show the regions or sub-regions.

1.2.2. Countries & Provinces

<http://www.fao.org/nr/water/aquastat/work/countries/select.html>

It might be possible that a new country comes into existence, such as recently the split of Sudan into Sudan and South Sudan. This change then takes place through this option. A new country “South Sudan” is created, using the correct ISO3 code and the start year of the country, while for the end year it can be given 9999. In the section “In use” the provinces can be created. The second new country to be created is “Sudan” doing the same as above. Then the third thing to do is modifying the previous “Sudan”, and in this case renaming it since the new “north” Sudan has kept the same name (and in this case even the same ISO3 code, which is very confusing and in fact strange) as the previous entire Sudan (“North” + “South”) by renaming it, by putting the end year (in this case 2010) and by unticking the “Disseminate” box. It is important not to disseminate anymore non-existing countries, since this might create double-counting if people don’t pay sufficient attention. It

sometimes happens that people would like to have the data of “old” countries and they can then be sent to them upon request, since they are still available in the WS. Also, to avoid double-counting in the WS, when selecting “Latest value” the non-existing countries do not appear.


1.2.3. Variables

<http://www.fao.org/nr/water/aquastat/work/variables/index.html>

See section 2.1 for more information on how to create a variable, section 2.2 for the list of variables available in the Main Database and section 2.5 for a categorization of the variables.


1.2.4. Calculation Rules

<http://www.fao.org/nr/water/aquastat/work/rules/cindex.html>

How to create a new calculation rule is self-explanatory when pushing the  button and also explained in section 2.1.2. See section 2.3 for the list of calculation rules available in the Main Database.

1.2.5. Validation Rules

<http://www.fao.org/nr/water/aquastat/work/rules/vindex.html>

How to create a new validation rule is self-explanatory when pushing the  button and also explained in section 2.1.3. See section 2.4 for the list of validation rules available in the Main Database.

1.2.6. Users

<http://www.fao.org/nr/water/aquastat/work/users/index.html>

This option is used to add users and give them the appropriate privileges, as explained in the beginning of this section 1. “Administrator privileges” should be given to the minimal number of people, such as the AQUASTAT Programme Manager only in the Technical Division AGL, the AQUASTAT focal point in CIO and the AQUASTAT SWS focal point in ESS. The reason for minimizing is not lack of trust, but to minimize possible mistakes and allow their tracking.

1.2.7. Publish to the dissemination system

<http://www.fao.org/nr/water/aquastat/work/publish/status.html>

There are four options:

- a. **Publish data:** Pushing this button publishes all new data, metadata, institutions, glossary terms created to the DS.
- b. **Publish PDF:** Pushing this button updates the three automatically created PDFs, the “Country Fact Sheet” (section 1.1.9), the “Water Resources Sheet” (section 1.1.11) and the “Irrigation Sheets” (section 1.1.12). Once completed, the new dates are shown at the bottom left of the PDF files.



- c. **Run ETL Job:** This function is not active at the moment. It would be part of the Federated Monitoring System and Key Water Indicator Portal work implemented by AQUASTAT on behalf of UN-Water (section 7.1).
- d. **Generate the dump files:** Pushing this button sends files to the “Journal Histories”, “Receipt”, “Report” and “Sources” folders in
\\hqlpptomc04.hq.un.fao.org\TC70AquastatWork_appdata_user\.

2. Main Database: variables and indicators


AQUASTAT variables related files and folders on the *Divisional shared drive* are located under:
<\\...\\AQUASTAT\\Variables-Calculation-Validation>

AQUASTAT variables related files in the Working System are in the Administrative Tools dropdown menu:

Variables: <http://www.fao.org/nr/water/aquastat/work/variables/index.html>


Calculation Rules: <http://www.fao.org/nr/water/aquastat/work/rules/cindex.html>

Validation Rules: <http://www.fao.org/nr/water/aquastat/work/rules/vindex.html>


The Main Database contains both variables and indicators, which are the result of a calculation using different variables. If it is possible to make a calculation, then in the WS in the query results page the icon  is given after the name and the symbol C is given after the value.

2.1. Creation of a new variable, calculation rule, validation rule and definition


2.1.1. Creation of a new variable

1. In <http://www.fao.org/nr/water/aquastat/work/variables/index.html>, click the plus  icon.
2. Go to the “Name” boxes and put the name in **ALL THREE LANGUAGES**: English, French and Spanish.
3. Select the correct unit.
4. Tick the “Disseminate” box if the variable should be visible to external users. If not ticked, then it is only available in the WS.
5. Push the save button.
6. Write down the Id number given to it.
7. See section 2.2 for list of variables on 20 December 2016 (blue is external, grey is internal only).
8. See section 2.5 for an analysis/categorization of variables.

2.1.2. Creation of a calculation rule


9. If this variable is used for a calculation or is itself calculated then open.
<http://www.fao.org/nr/water/aquastat/work/rules/cindex.html> and push the plus  icon.
10. Under “Target Variable ID” put the number given under point 6 above.
11. Follow the instructions for the calculation rules.
12. See section 2.3 for the list of calculation rules on 20 December 2016.


2.1.3. Creation of a validation rule

13. Quality control can be performed by creating a validation rule for this variable, if possible.
14. As an example, a validation rule for arable land could be that it can never be larger than total area of the country.
15. Open <http://www.fao.org/nr/water/aquastat/work/rules/vindex.html> and push the plus  icon.

16. Follow the instruction to create the rule.
17. Tick the “Required Rule” if the rule is absolutely true like the above example that the arable land area can never be larger than the total area if the country. If it happens, then there will be a “stop sign” during validation and corrections have to be made in order to be able to continue.
18. If it is a rule that is important for quality control but not a required rule, then don’t tick. In that case a warning sign will appear during validation if the rule is not followed. Such a rule is for example that the permanent crop area is smaller than the arable land area, which is the case for most countries. If during validation it seems that permanent crop area is larger than arable land area the warning sign appears to make the validator aware and check whether this is really correct. If yes, then it can be accepted and the validation can continue and will not be blocked as is the case with the stop sign.
19. See section 2.4 for the list of validation rules on 20 December 2016.

2.1.4. Creation of the definition of the variable in the glossary

20. Go to the “Glossary” <http://www.fao.org/nr/water/aquastat/work/glossary/search.html> and push the “Add New” button.
21. Under “name” use **EXACTLY** the same variable name, including spaces, dots, or other, in the three languages.
22. Fill in the definitions and units in **ALL THREE** languages.
23. Put the calculation rule, if applicable.
24. In the “Subject(s)” box, select the ones wanted PLUS also the first one “AQUASTAT Main Database”. It is important to select this one, because that allows the user to go to the database when selecting this glossary item. In that case in the glossary results page the following is added and clickable:
 **View data for this variable [4103] in the AQUASTAT Main Database**
25. Push the “Save” button and then search the item and open again the edit screen by pushing the edit icon to the left.
26. Change the “Code number” to the Variable_Id given under point 6 above.
27. Save again

In addition to the glossary, the definition of the variable will also be visible when clicking on the  icon next to the variable name in the database query page <http://www.fao.org/nr/water/aquastat/data/query/index.html?lang=en>.

Once all finished, push the “Publish to Dissemination System” button under the “Administrative Tools” dropdown menu (see section 1.2.7).

2.2. List of variables and indicators

The variables and indicators below are the ones existing in the Main Database on 20 December 2016. The ones in blue font are external ones (DS), the ones in grey font are only available internally (WS). The bold dark blue title refers to the category, the underlined dark blue title refers to the sub-category.

The order of the variables can be changed and variables can be moved between sub-categories.

Geography and population

Land use

- 4100. Total area of the country
- 4101. Arable land area
- 4102. Permanent crops area
- 4103. Cultivated area (arable land + permanent crops)
- 4470. % of total country area cultivated

Population

- 4104. Total population
- 4105. Rural population
- 4106. Urban population
- 4107. Population density
- 4449. Population economically active
- 4108. Population economically active in agriculture
- 4109. Male population economically active in agriculture
- 4110. Female population economically active in agriculture
- 4538. % of economically active population active in agriculture

Economy, development and food security

- 4112. Gross Domestic Product (GDP)
- 4458. GDP per capita
- 4113. Agriculture, value added to GDP
- 4111. Human Development Index (HDI) [highest = 1]
- 4537. Gender Inequality Index (GII) [equality = 0; inequality = 1]
- 4474. Prevalence of undernourishment (3-year average)
- 4473. Number of people undernourished (3-year average)

Water resources

Precipitation

- 4151. Long-term average annual precipitation in depth
- 4150. Long-term average annual precipitation in volume
- 4472. National Rainfall Index (NRI)

Internal renewable water resources

- 4155. Surface water produced internally
- 4154. Groundwater produced internally
- 4156. Overlap between surface water and groundwater
- 4157. Total internal renewable water resources (IRWR)
- 4158. Total internal renewable water resources per capita
- 4153. Water resources produced internally in a 10th dry year frequency

External renewable water resources

- 4159. Surface water: entering the country (total)
- 4160. Surface water: inflow not submitted to treaties
- 4161. Surface water: inflow submitted to treaties
- 4162. Surface water: inflow secured through treaties
- 4165. Surface water: total flow of border rivers
- 4168. Surface water: accounted flow of border rivers
- 4164. Surface water: accounted inflow
- 4171. Surface water: leaving the country to other countries (total)
- 4172. Surface water: outflow to other countries not submitted to treaties



- 4173. Surface water: outflow to other countries submitted to treaties
- 4174. Surface water: outflow to other countries secured through treaties
- 4176. Surface water: total external renewable
- 4177. Groundwater: entering the country (total)
- 4452. Groundwater: accounted inflow
- 4178. Groundwater: leaving the country to other countries (total)
- 4453. Groundwater: accounted outflow to other countries
- 4182. Water resources: total external renewable

Total renewable water resources

- 4185. Total renewable surface water
- 4187. Total renewable groundwater
- 4536. Overlap: between surface water and groundwater
- 4188. Total renewable water resources
- 4192. Dependency ratio
- 4190. Total renewable water resources per capita

Exploitable water resources and dam capacity

- 4193. Exploitable: regular renewable surface water
- 4194. Exploitable: irregular renewable surface water
- 4509. Exploitable: total renewable surface water
- 4195. Exploitable: regular renewable groundwater
- 4196. Total exploitable water resources
- 4541. Interannual variability (WRI)
- 4542. Seasonal variability (WRI)
- 4197. Total dam capacity
- 4471. Dam capacity per capita

Water use

Water withdrawal by sector

- 4250. Agricultural water withdrawal
- 4476. Water withdrawal for livestock (watering and cleaning)
- 4477. Water withdrawal for aquaculture
- 4252. Industrial water withdrawal
- 4479. Water withdrawal for manufactured products
- 4460. Water withdrawal for cooling of thermoelectric plants
- 4480. Water withdrawal for other industries
- 4251. Municipal water withdrawal
- 4152. Evaporation from artificial lakes and reservoirs
- 4253. Total water withdrawal
- 4475. Irrigation water withdrawal
- 4260. Irrigation water requirement
- 4254. Agricultural water withdrawal as % of total water withdrawal
- 4256. Industrial water withdrawal as % of total water withdrawal
- 4255. Municipal water withdrawal as % of total withdrawal
- 4257. Total water withdrawal per capita
- 4532. Agricultural water withdrawal per capita
- 4531. Industrial water withdrawal per capita
- 4457. Municipal water withdrawal per capita (total population)
- 4468. Municipal water withdrawal per capita (urban population)
- 4499. Water from Water Supply Entity used by agriculture
- 4500. Water from Water Supply Entity used by industry

- 4501. Water from Water Supply Entity used by households
- 4506. Total Water Supply Entity (WSE) water used
- 4503. Total water used by agriculture
- 4504. Total water used by industry
- 4505. Total water used by households
- 4502. Total water used (withdrawal and WSE)
- 4508. In-stream water usage by hydropower plants
- 4511. Water reserved for ecosystems

Water withdrawal by source

- **4261. Fresh surface water withdrawal (primary and secondary)**
- 4481. Agricultural fresh surface water withdrawal (self-abstracted)
- 4497. Fresh surface water withdrawal for irrigation (self-abstracted)
- 4482. Industrial fresh surface water withdrawal (self-abstracted)
- 4483. Municipal fresh surface water withdrawal (self-abstracted)
- **4262. Fresh groundwater withdrawal (primary and secondary)**
- 4484. Agricultural fresh groundwater withdrawal (self-abstracted)
- 4492. Fresh groundwater withdrawal for irrigation (self-abstracted)
- 4485. Industrial fresh groundwater withdrawal (self-abstracted)
- 4486. Municipal fresh groundwater withdrawal (self-abstracted)
- **4263. Total freshwater withdrawal (primary and secondary)**
- 467. Freshwater withdrawal as % of total water withdrawal
- 4487. Agricultural freshwater withdrawal (self-abstracted)
- 4507. Freshwater withdrawal for irrigation (self-abstracted)
- 4488. Industrial freshwater withdrawal (self-abstracted)
- 4489. Municipal freshwater withdrawal (total)
- 4496. Freshwater withdrawal by water supply entity
- 4478. Freshwater withdrawal by households (self-abstracted)
- 4498. Freshwater withdrawal by services (self-abstracted)
- **4264. Desalinated water produced**
- 4494. Desalinated water for municipalities
- 4495. Desalinated water for agriculture
- **4535. Direct use of treated municipal wastewater**
- **4451. Direct use of agricultural drainage water**

Groundwater depletion

- 4266. Depletion rate of renewable groundwater resources
- 4267. Abstraction of fossil groundwater
- 4268. Expected time that fossil groundwater will last

Wastewater

- 4269. Produced municipal wastewater
- 4493. Collected municipal wastewater
- 4270. Treated municipal wastewater
- 4515. Number of municipal wastewater treatment facilities
- 4516. Capacity of the municipal wastewater treatment facilities
- 4491. Not treated municipal wastewater
- 4510. Treated municipal wastewater discharged (secondary water)
- 4517. Not treated municipal wastewater discharged (secondary water)
- 4265. Direct use of treated municipal wastewater
- 4490. Direct use of treated municipal wastewater for irrigation purposes
- 4512. Direct use of not treated municipal wastewater for irrigation purposes
- 4530. Produced industrial wastewater

- 4533. Area equipped for irrigation by direct use of treated municipal wastewater
- 4534. Area equipped for irrigation by direct use of not treated municipal wastewater

Pressure on water resources

- 4275. Freshwater withdrawal as % of total renewable water resources
- 4450. Freshwater withdrawal as % of internal renewable water resources
- 4273. Agricultural water withdrawal as % of total renewable water resources
- 4271. Agricultural water requirement as % of agricultural water withdrawal

Irrigation and drainage development

Area under agricultural water management

- 4307. Irrigation potential
- 4308. Area equipped for full control irrigation: surface irrigation
- 4309. Area equipped for full control irrigation: sprinkler irrigation
- 4310. Area equipped for full control irrigation: localized irrigation
- 4459. Area equipped for full control irrigation: pressurized (sprinkler + localized)
- 4311. Area equipped for full control irrigation: total
- 4461. Area equipped for full control irrigation: actually irrigated
- 4463. % of area equipped for full control irrigation actually irrigated
- 4312. Area equipped for irrigation: equipped lowland areas
- 4316. Area equipped for irrigation: spate irrigation
- 4313. Area equipped for irrigation: total
- 4544. % of the area equipped for irrigation managed by women
- 4545. % of the agricultural holdings with irrigation managed by women
- 4318. Area equipped for irrigation: actually irrigated
- 4328. % of the area equipped for irrigation actually irrigated
- 4331. % of the cultivated area equipped for irrigation
- 4330. % of irrigation potential equipped for irrigation
- 4314. Flood recession cropping area non-equipped
- 4315. Cultivated wetlands and inland valley bottoms non-equipped
- 4448. Other agricultural water managed area
- 4317. Total agricultural water managed area
- 4319. % of agricultural water managed area equipped for irrigation

Area equipped for irrigation by source of water

- 4321. Area equipped for irrigation by surface water
- 4320. Area equipped for irrigation by groundwater
- 4322. Area equipped for irrigation by mixed surface water and groundwater
- 4465. Area equipped for irrigation by direct use of treated municipal wastewater
- 4513. Area equipped for irrigation by direct use of non-treated municipal wastewater
- 4526. Area equipped for irrigation by direct use of agricultural drainage water
- 4539. Area equipped for irrigation by desalinated water
- 4324. % of area equipped for irrigation by surface water
- 4323. % of area equipped for irrigation by groundwater
- 4325. % of area equipped for irrigation by mixed surface water and groundwater
- 4466. % of area equipped for irrigation by direct use of treated municipal wastewater
- 4514. % of area equipped for irrigation by direct use of non-treated municipal wastewater
- 4527. % of area equipped for irrigation by direct use of agricultural drainage water
- 4540. % of area equipped for irrigation by desalinated water

Power irrigated area

- 4326. Area equipped for power irrigation (surface water or groundwater)

- 4327. % of area equipped for irrigation power irrigated

Irrigation schemes by size

- 4332. Total area of small irrigation schemes
- 4333. Total area of medium irrigation schemes
- 4334. Total area of large irrigation schemes

Investments in irrigation

- 4335. Average cost of irrigation development in public schemes
- 4336. Average cost of operation and maintenance in public schemes
- 4337. Average cost of drainage development in public schemes
- 4338. Average cost of irrigation rehabilitation in public schemes
- 4339. Average cost of irrigation development in private schemes
- 4340. Average cost of operation and maintenance cost in private schemes
- 4341. Average cost of drainage development in private schemes
- 4342. Average cost of irrigation rehabilitation in private schemes
- 4343. Average cost of installation of sprinkler irrigation: on farm
- 4344. Average cost of installation of localized irrigation: on farm

Irrigated crop area and cropping intensity

- 4379. Total harvested irrigated crop area (full control irrigation)
- 4462. Harvested irrigated crop area as % of the full control irrigation area actually irrigated
- 4520. Harvested irrigated temporary crop area: Total
- 4521. Harvested irrigated permanent crop area: Total
- 4469. Permanent meadows and pastures irrigated
- 4464. Irrigated cropping intensity
- 4345. Harvested irrigated temporary crop area: Wheat
- 4346. Harvested irrigated temporary crop area: Rice
- 4347. Harvested irrigated temporary crop area: Barley
- 4348. Harvested irrigated temporary crop area: Maize
- 4349. Harvested irrigated temporary crop area: Millet
- 4350. Harvested irrigated temporary crop area: Sorghum
- 4351. Harvested irrigated temporary crop area: Other cereals
- 4360. Harvested irrigated temporary crop area: Vegetables
- 4371. Harvested irrigated temporary crop area: Soybeans
- 4372. Harvested irrigated temporary crop area: Groundnuts
- 4374. Harvested irrigated temporary crop area: Sesame
- 4373. Harvested irrigated temporary crop area: Sunflower
- 4352. Harvested irrigated temporary crop area: Potatoes
- 4353. Harvested irrigated temporary crop area: Sweet potatoes
- 4354. Harvested irrigated temporary crop area: Cassava
- 4355. Harvested irrigated temporary crop area: Other roots and tubers
- 4359. Harvested irrigated temporary crop area: Leguminous crops
- 4358. Harvested irrigated temporary crop area: Sugar beet
- 4357. Harvested irrigated temporary crop area: Sugarcane
- 4369. Harvested irrigated temporary crop area: Fodder
- 4367. Harvested irrigated temporary crop area: Cotton
- 4376. Harvested irrigated temporary crop area: Flowers
- 4366. Harvested irrigated temporary crop area: Tobacco
- 4377. Harvested irrigated temporary crop area: Other crops
- 4356. Harvested irrigated permanent crop area: Plantains
- 4361. Harvested irrigated permanent crop area: Bananas
- 4362. Harvested irrigated permanent crop area: Citrus



- 4523. Harvested irrigated permanent crop area: Grapes
- 4524. Harvested irrigated permanent crop area: Other fruits
- 4375. Harvested irrigated permanent crop area: Coconuts
- 4525. Harvested irrigated permanent crop area: Olives
- 4370. Harvested irrigated permanent crop area: Oil palm
- 4364. Harvested irrigated permanent crop area: Coffee
- 4365. Harvested irrigated permanent crop area: Tea
- 4363. Harvested irrigated permanent crop area: Cocoa beans
- 4522. Harvested irrigated permanent crop area: Grass and Fodder
- 4368. Harvested irrigated permanent crop area: Rubber
- 4378. Harvested irrigated permanent crop area: Other crops
- 4329. % of total grain production irrigated

Irrigated crop yield

- 4410. Irrigated crop yield: Wheat
- 4411. Irrigated crop yield: Rice
- 4412. Irrigated crop yield: Barley
- 4413. Irrigated crop yield: Maize
- 4414. Irrigated crop yield: Millet
- 4415. Irrigated crop yield: Sorghum
- 4416. Irrigated crop yield: Other cereals
- 4417. Irrigated crop yield: Potatoes
- 4418. Irrigated crop yield: Sweet potatoes
- 4419. Irrigated crop yield: Cassava
- 4420. Irrigated crop yield: Other roots and tubers
- 4421. Irrigated crop yield: Plantains
- 4422. Irrigated crop yield: Sugar cane
- 4423. Irrigated crop yield: Sugar beet
- 4424. Irrigated crop yield: Pulses
- 4425. Irrigated crop yield: Vegetables
- 4426. Irrigated crop yield: Bananas
- 4427. Irrigated crop yield: Citrus
- 4428. Irrigated crop yield: Cocoa beans
- 4429. Irrigated crop yield: Coffee
- 4430. Irrigated crop yield: Tea
- 4431. Irrigated crop yield: Tobacco
- 4432. Irrigated crop yield: Cotton
- 4433. Irrigated crop yield: Rubber
- 4434. Irrigated crop yield: Fodder
- 4435. Irrigated crop yield: Oil palm
- 4436. Irrigated crop yield: Soybeans
- 4437. Irrigated crop yield: Groundnuts
- 4438. Irrigated crop yield: Sunflower
- 4439. Irrigated crop yield: Sesame
- 4440. Irrigated crop yield: Coconuts
- 4441. Irrigated crop yield: Flowers

Drainage

- 4303. Area equipped for irrigation drained
- 4304. Non-irrigated cultivated area drained
- 4300. Total cultivated area drained
- 4446. % of area equipped for irrigation drained
- 4305. % of total cultivated area drained

Conservation agriculture and water harvesting

Conservation agriculture

- 4454. Conservation agriculture area
- 4455. Conservation agriculture area as % of arable land area

Water harvesting

- 4306. Water harvesting area

Environment and health

Environment

- 4400. Area salinized by irrigation
- 4445. % of area equipped for irrigation salinized
- 4401. Area waterlogged by irrigation
- 4543. Flood occurrence (WRI)

Access to improved drinking water source

- 4114. Total population with access to safe drinking-water (JMP)
- 4115. Rural population with access to safe drinking-water (JMP)
- 4116. Urban population with access to safe drinking-water (JMP)

Health

- 4403. Population affected by water related disease

2.3. List of calculation rules

The “primary variable” option was created in order to avoid having to fill in the database with zeros in order to be able to calculate. If a variable is indicated as primary variable, this means that even if no information is available on the other variables used in the calculation, the total will be given (by conserving the ones that don't have a value to be 0). This is for example if one of the variables is always much much larger than the others. However, this option should be used with much caution and in fact, due to certain complexities, we are thinking of abolishing this option and go back to fill in zeros needed to do a calculation.

The list below shows the Calculation Rules available in the Main Database on 20 December 2016. The numbers refer to the number of the variable given in section 2.2.

Variable	Op	Expression	Primary Variable
[4103]	=	[4101]+[4102]	
[4105]	=	[4104]-[4106]	
[4107]	=	[4104]/([4100]/100)	
[4108]	=	[4109]+[4110]	
[4150]	=	[4100]*[4151]/100000	
[4157]	=	[4154]+[4155]-[4156]	
[4158]	=	[4157]*1000000/[4104]	4157
[4164]	=	[4160]+[4162]+[4168]	
[4176]	=	[4160]+[4162]+[4168]-[4174]	
[4182]	=	[4176]+[4452]	
[4185]	=	[4176]+[4155]	
[4187]	=	[4154]+[4452]	
[4188]	=	[4185]+[4187]-[4156]	








































Variable	Op	Expression	Primary Variable
[4190]	=	[4188]*1000000/[4104]	4188
[4192]	=	100*([4164]+[4452])/([4164]+[4452]+[4157])	
[4196]	=	[4509]+[4195]	
[4253]	=	[4251]+[4252]+[4250]	
[4254]	=	[4250]/[4253]*100	
[4255]	=	[4251]/[4253]*100	
[4256]	=	[4252]/[4253]*100	
[4257]	=	[4253]*1000000/[4104]	4253
[4263]	=	[4253]-[4264]-[4265]-[4451]	4253
[4271]	=	100*[4260]/[4250]	
[4273]	=	100*[4250]/[4188]	4250
[4275]	=	100*[4263]/[4188]	4263
[4300]	=	[4303]+[4304]	
[4305]	=	100*[4300]/[4103]	4300
[4311]	=	[4308]+[4309]+[4310]	4308
[4313]	=	[4311]+[4312]+[4316]	4311
[4317]	=	[4313]+[4314]+[4315]	4313
[4319]	=	100*[4313]/[4317]	
[4323]	=	100*[4320]/[4313]	
[4324]	=	100*[4321]/[4313]	
[4325]	=	100*[4322]/[4313]	
[4327]	=	100*[4326]/[4313]	
[4328]	=	100*[4318]/[4313]	
[4330]	=	100*[4313]/[4307]	4313
[4331]	=	100*[4313]/[4103]	4313
[4445]	=	100*[4400]/[4313]	
[4446]	=	100*[4303]/[4313]	
[4448]	=	[4314]+[4315]	
[4450]	=	100*[4263]/[4157]	4263
[4455]	=	100*[4454]/[4101]	4454
[4456]	=	[4160]+[4162]+[4168]+[4170]	
[4457]	=	[4251]*1000000/[4104]	4251
[4458]	=	[4112]/[4104]/1000	4112
[4459]	=	[4309]+[4310]	4309
[4462]	=	100*[4379]/[4461]	
[4463]	=	100*[4461]/[4311]	
[4464]	=	100*[4379]/[4461]	
[4466]	=	100*[4465]/[4313]	
[4467]	=	100*[4263]/[4253]	4263
[4468]	=	[4251]*1000000/[4106]	4251
[4470]	=	100*[4103]/[4100]	4103
[4471]	=	1000000*[4197]/[4104]	4197
[4509]	=	[4193]+[4194]	
[4514]	=	100*[4513]/[4313]	
[4527]	=	100*[4526]/[4313]	
[4531]	=	[4252]*1000000/[4104]	
[4532]	=	[4250]*1000000/[4104]	
[4533]	=	[4465]	
[4534]	=	[4513]	
[4535]	=	[4265]	
[4536]	=	[4156]	
[4538]	=	100*[4108]/[4449]	
[4540]	=	100*[4539]/[4313]	

2.4. List of validation rules

The validation rules below are the ones existing in the Main Database on 20 December 2016. The numbers refer to the number of the variable in section 2.2.

The first column refers to required rule (red stop sign) or wished rule (yellow warning sign):

- A red rule is for example that the arable land area [4101] is always smaller than the total area of the country [4100]. If that is not the case, the validation procedure stops and first the correction has to be made in order to be able to continue the validation.
- A warning rule is for example that in general the area with permanent crops [4102] is smaller than the arable land area [4101]. If this is not the case, the systems warns and it should be verified that it is really correct that this rule is not valid for the specific country. If that is the case, the procedure can continue without being stopped.

Req	Left Expression	Op	Right Expression
	[4100]	>	[4103]
	[4100]	>	[4300]
	[4100]	>	[4313]
	[4100]	>	[4317]
	[4100]	>	[4102]
	[4100]	>	[4303]
	[4100]	>	[4304]
	[4100]	>	[4306]
	[4100]	>	[4307]
	[4100]	>	[4308]
	[4100]	>	[4309]
	[4100]	>	[4310]
	[4100]	>	[4311]
	[4100]	>	[4314]
	[4100]	>	[4315]
	[4100]	>	[4316]
	[4100]	>	[4318]
	[4100]	>	[4321]
	[4100]	>	[4320]
	[4100]	>	[4322]
	[4100]	>	[4326]
	[4100]	>	[4333]
	[4100]	>	[4334]
	[4100]	>	[4345]
	[4100]	>	[4379]
	[4100]	>	[4400]
	[4100]	>	[4401]
	[4100]	>	[4402]
	[4100]	>	[4465]
	[4100]	>	[4526]
	[4100]	>	[4513]
	[4101]	<=	[4100]
	[4102]	<=	[4101]
	[4103]	>	[4313]
	[4103]	>	[4300]
	[4103]	>=	[4102]
	[4103]	>	[4304]



Reg	Left Expression	Op	Right Expression
	[4103]	>	[4315]
	[4103]	>	[4314]
	[4103]	>	[4303]
	[4103]	>	[4332]
	[4103]	>	[4333]
	[4103]	>	[4334]
	[4103]	>	[4400]
	[4103]	>	[4401]
	[4103]	>	[4402]
	[4103]	>	[4316]
	[4103]	>	[4318]
	[4103]	>	[4320]
	[4103]	>	[4321]
	[4103]	>	[4322]
	[4103]	>	[4326]
	[4103]	>	[4308]
	[4103]	>	[4309]
	[4103]	>	[4310]
	[4103]	>	[4311]
	[4103]	>=	[4101]
	[4103]	>	[4465]
	[4103]	>	[4513]
	[4103]	>	[4526]
	[4104]*[4114]	==	[4105]*[4115]+[4106]*[4116]
	[4105] / [4104]	>=	0.12
	[4105] / [4104]	<=	0.85
	[4106] / [4104]	>=	0.14
	[4106] / [4104]	<=	0.88
	[4111]	<=	1
	[4113]	<=	100
	[4114]	<=	100
	[4114]	>=	48
	[4114]	<=	90
	[4115]	<=	100
	[4115]	>=	36
	[4115]	<=	90
	[4116]	<=	100
	[4116]	>=	76
	[4116]	<=	90
	[4150] * 100000 / [4100]	>=	50
	[4150] * 100000 / [4100]	<=	2000
	[4154]	<=	[4157]
	[4154]	<=	[4150]
	[4155]	<=	[4157]
	[4155]	<=	[4150]
	[4156]	<=	[4154]
	[4156]	<=	[4155]
	[4157]	<	[4150]
	[4157] / [4150]	<=	0.5
	[4157] * 100000 / [4100]	>=	10
	[4157] * 100000 / [4100]	<=	1500
	[4158]	>=	350
	[4160]	<=	[4159]
	[4161]	<=	[4159]

Reg	Left Expression	Op	Right Expression
⚠	[4167]	<=	[4165]
⚠	[4168]	<=	[4167]
⚠	[4170]	<=	[4169]
⚠	[4171]	<=	[4157]+[4456]
⚠	[4174]	<=	[4173]
⚠	[4188]	>=	[4157]
⚠	[4188]	>=	[4182]
⚠	[4190]	>=	560
⚠	[4190]	<=	93500
⊖	[4192]	<=	100
⚠	[4250] / [4253]	>=	0.1
⚠	[4250] / [4253]	<=	0.9
⚠	[4250] / [4317]	>=	0.002
⚠	[4250] / [4317]	<=	0.02
⚠	[4250] / [4379]	>=	0.005
⚠	[4250] / [4379]	<=	0.025
⚠	[4251] / [4253]	>=	0.03
⚠	[4251] / [4253]	<=	0.46
⚠	[4252] / [4253]	>=	0.01
⚠	[4252] / [4253]	<=	0.45
⊖	[4254]	<=	100
⊖	[4255]	<=	100
⊖	[4256]	<=	100
⚠	[4257]	>=	50
⚠	[4257]	<=	1430
⚠	[4263]	==	[4261]+[4262]
⚠	[4263]	<	2000
⊖	[4263]	<=	[4253]
⚠	[4265]	>=	[4490]
⚠	[4269]	<=	[4253]
⚠	[4269]	>=	[4493]
⚠	[4269]	==	[4270]+[4491]
⚠	[4270]	<=	[4269]
⚠	[4270]	>=	[4265]
⊖	[4271]	<=	100
⚠	[4273]	<=	100
⚠	[4275]	<=	100
⚠	[4300]	<=	[4317]
⚠	[4303]	<=	[4300]
⚠	[4303]+[4304]	==	[4300]
⚠	[4304]	<=	[4300]
⊖	[4305]	<=	100
⚠	[4305]	<=	70
⊖	[4305]	<=	100
⚠	[4308] / [4313]	>=	0.5
⚠	[4308]+[4309]+[4310]	==	[4332]+[4333]+[4334]
⚠	[4309] / [4313]	<=	0.6
⚠	[4310] / [4313]	<=	0.2
⊖	[4311]	>=	[4308]
⊖	[4311]	>=	[4309]
⊖	[4311]	>=	[4310]
⊖	[4313]	<=	[4317]
⊖	[4313]	>=	[4326]
⊖	[4313]	>=	[4320]+[4321]+[4322]+[4465]+[4513]+[4526]

Reg	Left Expression	Op	Right Expression
⊖	[4313]	>=	[4321]
⊖	[4313]	>=	[4322]
⊖	[4313]	>=	[4303]
⊖	[4313]	>	[4465]
⊖	[4313]	>	[4513]
⊖	[4313]	>	[4526]
⚠	[4317]	<=	[4103]
⊖	[4318]	<=	[4313]
⊖	[4319]	<=	100
⚠	[4320] / [4313]	<=	0.7
⚠	[4321] / [4313]	<=	0.9
⊖	[4323]	<=	100
⊖	[4324]	<=	100
⊖	[4325]	<=	100
⊖	[4327]	<=	100
⊖	[4328]	<=	100
⊖	[4329]	<=	100
⚠	[4330]	<=	100
⚠	[4331]	<=	100
⚠	[4335]	>=	1000
⚠	[4335]	<=	20000
⚠	[4339]	>=	1000
⚠	[4339]	<=	20000
⚠	[4343]	>=	1000
⚠	[4343]	<=	20000
⚠	[4344]	>=	1000
⚠	[4344]	<=	20000
⚠	[4379]/[4317]	>=	0.5
⚠	[4400]	<=	[4313]
⚠	[4401]	<=	[4313]
⚠	[4401] / [4313]	<=	0.5
⊖	[4403]	<=	[4104]
⊖	[4445]	<=	100
⊖	[4446]	<=	100
⚠	[4450]	<=	100
⊖	[4475]	<=	[4250]
⚠	[4493]	>=	[4270]

2.5. AQUASTAT variables: categorization combining of three criteria

The table in section 2.5.1 shows the categorization of the variables and indicators, as follows:

1. **Column E:** Is the variable shown in the dissemination system (D) or only in the working system (I)?
2. **Column F:** Is the variable a primary variable (V) or a calculated variable (i.e. indicator) (C)?
3. **Column G:** Are the data for this variable reported by AQUASTAT (A) or coming from another agency (O) or calculated (C)?

The combination D+V+A (column H) gives the number of “primary” variables available to the external users for which AQUASTAT collects data (total 111), see section 2.5.2. See section 2.5.3 for detailed legend.

2.5.1. Categorization of all variables and indicators

A	B	C	D	E	F	G	H
Nr.	Cat.	Subc.	Variable	D/I	V/C	O/A/C	D+V+A
1	A	A1	4100. Total area	D	V	O	
2	A	A1	4101. Arable land	D	V	O	
3	A	A1	4102. Permanent crops	D	V	O	
4	A	A1	4103. Cultivated area (arable land + permanent crops)	D	C	C	
5	A	A1	4470. % of total country area cultivated	D	C	C	
6	A	A2	4104. Total population	D	V	O	
7	A	A2	4105. Rural population	D	V	O	
8	A	A2	4106. Urban population	D	C	C	
9	A	A2	4107. Population density	D	C	C	
10	A	A2	4449. Population economically active	I	V	O	
11	A	A2	4108. Population economically active in agriculture	I	C	C	
12	A	A2	4109. Male population economically active in agriculture	I	V	O	
13	A	A2	4110. Female population economically active in agriculture	I	V	O	
14	A	A2	4538. % of economically active population active in agriculture	I	C	C	
15	A	A3	4112. Gross Domestic Product (GDP)	D	V	O	
16	A	A3	4458. GDP per capita	D	C	C	
17	A	A3	4113. Agriculture, value added to GDP	D	V	O	
18	A	A3	4111. Human Development Index (HDI) [highest = 1]	D	V	O	
19	A	A3	4537. Gender Inequality Index (GII) [equality = 0; inequality = 1]	D	V	O	
20	A	A3	4474. Prevalence of undernourishment (3-year average)	D	V	O	
21	A	A3	4473. Number people undernourished (3-year average)	D	V	O	
22	B	B1	4151. Long-term average annual precipitation in depth	D	V	O	
23	B	B1	4150. Long-term average annual precipitation in volume	D	C	C	
24	B	B1	4472. National Rainfall Index (NRI)	D	V	O	
25	B	B2	4155. Surface water produced internally	D	V	A	X
26	B	B2	4154. Groundwater produced internally	D	V	A	X
27	B	B2	4156. Overlap between surface water and groundwater	D	V	A	X
28	B	B2	4157. Total internal renewable water resources (IRWR)	D	C	C	
29	B	B2	4158. Total internal renewable water resources per capita	D	C	C	
30	B	B2	4153. Water resources produced internally in a 10 th dry year frequency	I	V	A	
31	B	B3	4159. Surface water: entering the country (total)	D	V	A	X
32	B	B3	4160. Surface water: inflow not submitted to treaties	D	V	A	X
33	B	B3	4161. Surface water: inflow submitted to treaties	D	V	A	X
34	B	B3	4162. Surface water: inflow secured through treaties	D	V	A	X
35	B	B3	4165. Surface water: total flow of border rivers	D	V	A	X
36	B	B3	4168. Surface water: accounted flow of border rivers	D	V	A	X
37	B	B3	4164. Surface water: accounted inflow	D	C	C	
38	B	B3	4171. Surface water: leaving the country (total)	D	V	A	X
39	B	B3	4172. Surface water: outflow not submitted to treaties	D	V	A	X
40	B	B3	4173. Surface water: outflow submitted to treaties	D	V	A	X
41	B	B3	4174. Surface water: outflow secured through treaties	D	V	A	X
42	B	B3	4176. Surface water: total external renewable	D	C	C	
43	B	B3	4177. Groundwater: entering the country (total)	D	V	A	X
44	B	B3	4452. Groundwater: accounted inflow	D	V	A	X
45	B	B3	4178. Groundwater: leaving the country (total)	D	V	A	X
46	B	B3	4453. Groundwater: accounted outflow	D	V	A	X
47	B	B3	4182. Water resources: total external renewable	D	C	C	
48	B	B4	4185. Total renewable surface water	D	C	C	
49	B	B4	4187. Total renewable groundwater	D	C	C	
50	B	B4	4536. Overlap: between surface water and groundwater	D	C	C	
51	B	B4	4188. Total renewable water resources	D	C	C	
52	B	B4	4192. Dependency ratio	D	C	C	
53	B	B4	4190. Total renewable water resources per capita	D	C	C	



54	B	B5	4193. Exploitable: regular renewable surface water	D	V	A	X
55	B	B5	4194. Exploitable: irregular renewable surface water	D	V	A	X
56	B	B5	4509. Exploitable: total renewable surface water	D	C	C	
57	B	B5	4195. Exploitable: regular renewable groundwater	D	V	A	X
58	B	B5	4196. Total exploitable water resources	D	C	C	
59	B	B5	4541. Inter-annual variability (WRI)	D	V	O	
60	B	B5	4542. Seasonal variability (WRI)	D	V	O	
61	B	B5	4197. Total dam capacity	D	V	A	X
62	B	B5	4471. Dam capacity per capita	D	C	C	
63	C	C1	4250. Agricultural water withdrawal	D	V	A	X
64	C	C1	4476. Water withdrawal for livestock (watering and cleaning)	I	V	A	
65	C	C1	4477. Water withdrawal for aquaculture	I	V	A	
66	C	C1	4252. Industrial water withdrawal	D	V	A	X
67	C	C1	4479. Water withdrawal for manufactured products	I	V	A	
68	C	C1	4460. Water withdrawal for cooling of thermoelectric plants	I	V	A	
69	C	C1	4480. Water withdrawal for other industries	I	V	A	
70	C	C1	4251. Municipal water withdrawal	D	V	A	X
71	C	C1	4152. Evaporation from artificial lakes and reservoirs	I	V	A	
72	C	C1	4253. Total water withdrawal	D	C	C	
73	C	C1	4475. Irrigation water withdrawal	D	V	A	X
74	C	C1	4260. Irrigation water requirement	D	V	A	X
75	C	C1	4254. Agricultural water withdrawal as % of total withdrawal	D	C	C	
76	C	C1	4256. Industrial water withdrawal as % of total water withdrawal	D	C	C	
77	C	C1	4255. Municipal water withdrawal as % of total withdrawal	D	C	C	
78	C	C1	4257. Total water withdrawal per capita	D	C	C	
79	C	C1	4532. Agricultural water withdrawal per capita	I	C	C	
80	C	C1	4531. Industrial water withdrawal per capita	I	C	C	
81	C	C1	4457. Municipal water withdrawal per capita (total population)	I	C	C	
82	C	C1	4468. Municipal water withdrawal per capita (urban population)	I	C	C	
83	C	C1	4499. Water from Water Supply Entity used by agriculture	I	V	A	
84	C	C1	4500. Water from Water Supply Entity used by industry	I	V	A	
85	C	C1	4501. Water from Water Supply Entity used by households	I	V	A	
86	C	C1	4506. Total Water Supply Entity (WSE) water used	I	V	A	
87	C	C1	4503. Total water used by agriculture	I	V	A	
88	C	C1	4504. Total water used by industry	I	V	A	
89	C	C1	4505. Total water used by households	I	V	A	
90	C	C1	4502. Total water used (withdrawal and WSE)	I	V	A	
91	C	C1	4508. In-stream water usage by hydropower plants	I	V	A	
92	C	C1	4511. Water reserved for ecosystems	I	V	A	
93	C	C2	4261. Fresh surface water withdrawal (primary and secondary)	D	V	A	X
94	C	C2	4481. Agricultural fresh surface water withdrawal (self-abstracted)	I	V	A	
95	C	C2	4497. Fresh surface water withdrawal for irrigation (self-abstracted)	I	V	A	
96	C	C2	4482. Industrial fresh surface water withdrawal (self-abstracted)	I	V	A	
97	C	C2	4483. Municipal fresh surface water withdrawal (self-abstracted)	I	V	A	
98	C	C2	4262. Fresh groundwater withdrawal (primary and secondary)	D	V	A	X
99	C	C2	4484. Agricultural fresh groundwater withdrawal (self-abstracted)	I	V	A	
100	C	C2	4492. Fresh groundwater withdrawal for irrigation (self-abstracted)	I	V	A	
101	C	C2	4485. Industrial fresh groundwater withdrawal (self-abstracted)	I	V	A	
102	C	C2	4486. Municipal fresh groundwater withdrawal (self-abstracted)	I	V	A	
103	C	C2	4263. Total freshwater withdrawal (primary and secondary)	D	C	C	
104	C	C2	4467. Freshwater withdrawal as % of total water withdrawal	I	C	C	
105	C	C2	4487. Agricultural freshwater withdrawal (self-abstracted)	I	V	A	
106	C	C2	4507. Freshwater withdrawal for irrigation (self-abstracted)	I	V	A	
107	C	C2	4488. Industrial freshwater withdrawal (self-abstracted)	I	V	A	
108	C	C2	4489. Municipal freshwater withdrawal (total)	I	V	A	
109	C	C2	4496. Freshwater withdrawal by water supply entity	I	V	A	
110	C	C2	4478. Freshwater withdrawal by households (self-abstracted)	I	V	A	



111	C	C2	4498. Freshwater withdrawal by services (self-abstracted)	I	V	A	
112	C	C2	4264. Desalinated water produced	D	V	A	X
113	C	C2	4494. Desalinated water for municipalities	I	V	A	
114	C	C2	4495. Desalinated water for agriculture	I	V	A	
115	C	C2	4535. Direct use of treated municipal wastewater	D	C	C	
116	C	C2	4451. Direct use of agricultural drainage water	D	V	A	X
117	C	C3	4266. Depletion rate of renewable groundwater resources	I	V	A	
118	C	C3	4267. Abstraction of fossil groundwater	I	V	A	
119	C	C3	4268. Expected time that fossil groundwater will last	I	V	A	
120	C	C4	4269. Produced municipal wastewater	D	V	A	X
121	C	C4	4493. Collected municipal wastewater	D	V	A	X
122	C	C4	4270. Treated municipal wastewater	D	V	A	X
123	C	C4	4515. Number of municipal wastewater treatment facilities	D	V	A	X
124	C	C4	4516. Capacity of the municipal wastewater treatment facilities	D	V	A	X
125	C	C4	4491. Not treated municipal wastewater	D	V	A	X
126	C	C4	4510. Treated municipal wastewater discharged (second. water)	D	V	A	X
127	C	C4	4517. Not treated municipal wastewater discharged (sec. water)	D	V	A	X
128	C	C4	4265. Direct use of treated municipal wastewater	D	V	A	X
129	C	C4	4490. Direct use of treated municipal wastewater for irrigation	D	V	A	X
130	C	C4	4512. Direct use of not treated municipal wastewater for irrigation	D	V	A	X
131	C	C4	4530. Produced industrial wastewater	I	V	A	
132	C	C4	4533. Area equipped by direct use of treated municipal wastewater	D	C	C	
133	C	C4	4534. Area equipped by direct use of not treated municipal wastewater	D	C	C	
134	C	C5	4275. Freshwater withdrawal as % of total renewable water res.	D	C	C	
135	C	C5	4450. Freshwater withdrawal as % of internal renew. water res.	I	C	C	
136	C	C5	4273. Agric. water withdrawal as % of total renewable water res.	D	C	C	
137	C	C5	4271. Agric. water requirement as % of agric. water withdrawal	I	C	C	
138	D	D1	4307. Irrigation potential	D	V	A	X
139	D	D1	4308. Area equipped for full control irrigation: surface irrigation	D	V	A	X
140	D	D1	4309. Area equipped for full control irrigation: sprinkler irrigation	D	V	A	X
141	D	D1	4310. Area equipped for full control irrigation: localized irrigation	D	V	A	X
142	D	D1	4459. Area equipped for full-control irrigation: pressurized (spr+loc)	I	C	C	
143	D	D1	4311. Area equipped for full-control irrigation: total	D	C	C	
144	D	D1	4461. Area equipped for full control irrigation: actually irrigated	D	V	A	X
145	D	D1	4463. % of area equipped for full control irrigation actually irrigated	D	C	C	
146	D	D1	4312. Area equipped for irrigation: equipped lowland areas	D	V	A	X
147	D	D1	4316. Area equipped for irrigation: spate irrigation	D	V	A	X
148	D	D1	4313. Area equipped for irrigation: total	D	C	C	
149	D	D1	4544. % of the area equipped for irrigation managed by women	D	V	A	X
150	D	D1	4545. % of the agric. holdings with irrigation managed by women	D	V	A	X
151	D	D1	4318. Area equipped for irrigation: actually irrigated	D	V	A	X
152	D	D1	4328. % of the area equipped for irrigation actually irrigated	D	C	C	
153	D	D1	4331. % of the cultivated area equipped for irrigation	D	C	C	
154	D	D1	4330. % of irrigation potential equipped for irrigation	D	C	C	
155	D	D1	4314. Flood recession cropping area non-equipped	D	V	A	X
156	D	D1	4315. Cultivated wetlands and inland valley bottoms non-equipped	D	V	A	X
157	D	D1	4448. Other agricultural water managed area	I	C	C	
158	D	D1	4317. Total agricultural water managed area	D	C	C	
159	D	D1	4319. % of agricultural water managed area equipped for irrigation	D	C	C	
160	D	D2	4321. Area equipped for irrigation by surface water	D	V	A	X
161	D	D2	4320. Area equipped for irrigation by groundwater	D	V	A	X
162	D	D2	4322. Area equipped by mixed surface water and groundwater	D	V	A	X
163	D	D2	4465. Area equipped by direct use of treated municipal wastewater	D	V	A	X
164	D	D2	4513. Area equipped by direct use of non-treated municipal wastewater	D	V	A	X
165	D	D2	4526. Area equipped by direct use of agricultural drainage water	D	V	A	X
166	D	D2	4539. Area equipped for irrigation by desalinated water	D	V	A	X
167	D	D2	4324. % of area equipped for irrigation by surface water	D	C	C	



168	D	D2	4323. % of area equipped for irrigation by groundwater	D	C	C	
169	D	D2	4325. % of area equipped by mixed surface water and groundwater	D	C	C	
170	D	D2	4466. % of area equipped by direct use of treated municipal wastewater	D	C	C	
171	D	D2	4514. % of area equipped by direct use of non-treated municipal ww.	D	C	C	
172	D	D2	4527. % of area equipped by direct use of agric. drainage water	D	C	C	
173	D	D2	4540. % of area equipped for irrigation by desalinated water	D	C	C	
174	D	D3	4326. Area equipped for power irrigation (surf. water or groundwater)	D	V	A	X
175	D	D3	4327. % of area equipped for irrigation power irrigated	D	C	C	
176	D	D4	4332. Total area of small irrigation schemes	I	V	A	
177	D	D4	4333. Total area of medium irrigation schemes	I	V	A	
178	D	D4	4334. Total area of large irrigation schemes	I	V	A	
179	D	D5	4335. Average cost of irrigation development in public schemes	I	V	A	
180	D	D5	4336. Average cost of operation and maintenance in public schemes	I	V	A	
181	D	D5	4337. Average cost of drainage development in public schemes	I	V	A	
182	D	D5	4338. Average cost of irrigation rehabilitation in public schemes	I	V	A	
183	D	D5	4339. Average cost of irrigation development in private schemes	I	V	A	
184	D	D5	4340. Average cost of operation and maintenance in private schemes	I	V	A	
185	D	D5	4341. Average cost of drainage development in private schemes	I	V	A	
186	D	D5	4342. Average cost of irrigation rehabilitation in private schemes	I	V	A	
187	D	D5	4343. Average cost of installation of sprinkler irrigation: on farm	I	V	A	
188	D	D5	4344. Average cost of installation of localized irrigation: on farm	I	V	A	
189	D	D6	4379. Total harvested irrigated crop area (full control irrigation)	D	V	A	X
190	D	D6	4462. Harvest irrigated crop area as % of the full control actually irrigated	I	C	C	
191	D	D6	4520. Harvested irrigated temporary crop area: Total	D	V	A	X
192	D	D6	4521. Harvested irrigated permanent crop area: Total	D	V	A	X
193	D	D6	4469. Permanent meadows and pastures irrigated	D	V	A	X
194	D	D6	4464. Irrigated cropping intensity	D	C	C	
195	D	D6	4345. Harvested irrigated temporary crop area: Wheat	D	V	A	X
196	D	D6	4346. Harvested irrigated temporary crop area: Rice	D	V	A	X
197	D	D6	4347. Harvested irrigated temporary crop area: Barley	D	V	A	X
198	D	D6	4348. Harvested irrigated temporary crop area: Maize	D	V	A	X
199	D	D6	4349. Harvested irrigated temporary crop area: Millet	D	V	A	X
200	D	D6	4350. Harvested irrigated temporary crop area: Sorghum	D	V	A	X
201	D	D6	4351. Harvested irrigated temporary crop area: Other cereals	D	V	A	X
202	D	D6	4360. Harvested irrigated temporary crop area: Vegetables	D	V	A	X
203	D	D6	4371. Harvested irrigated temporary crop area: Soybeans	D	V	A	X
204	D	D6	4372. Harvested irrigated temporary crop area: Groundnuts	D	V	A	X
205	D	D6	4374. Harvested irrigated temporary crop area: Sesame	D	V	A	X
206	D	D6	4373. Harvested irrigated temporary crop area: Sunflower	D	V	A	X
207	D	D6	4352. Harvested irrigated temporary crop area: Potatoes	D	V	A	X
208	D	D6	4353. Harvested irrigated temporary crop area: Sweet potatoes	D	V	A	X
209	D	D6	4354. Harvested irrigated temporary crop area: Cassava	D	V	A	X
210	D	D6	4355. Harvested irrigated temporary crop area: Other roots and tubers	D	V	A	X
211	D	D6	4359. Harvested irrigated temporary crop area: Leguminous crops	D	V	A	X
212	D	D6	4358. Harvested irrigated temporary crop area: Sugar beet	D	V	A	X
213	D	D6	4357. Harvested irrigated temporary crop area: Sugarcane	D	V	A	X
214	D	D6	4369. Harvested irrigated temporary crop area: Fodder	D	V	A	X
215	D	D6	4367. Harvested irrigated temporary crop area: Cotton	D	V	A	X
216	D	D6	4376. Harvested irrigated temporary crop area: Flowers	D	V	A	X
217	D	D6	4366. Harvested irrigated temporary crop area: Tobacco	D	V	A	X
218	D	D6	4377. Harvested irrigated temporary crop area: Other crops	D	V	A	X
219	D	D6	4356. Harvested irrigated permanent crop area: Plantains	D	V	A	X
220	D	D6	4361. Harvested irrigated permanent crop area: Bananas	D	V	A	X
221	D	D6	4362. Harvested irrigated permanent crop area: Citrus	D	V	A	X
222	D	D6	4523. Harvested irrigated permanent crop area: Grapes	D	V	A	X
223	D	D6	4524. Harvested irrigated permanent crop area: Other fruits	D	V	A	X
224	D	D6	4375. Harvested irrigated permanent crop area: Coconuts	D	V	A	X



225	D	D6	4525. Harvested irrigated permanent crop area: Olives	D	V	A	X
226	D	D6	4370. Harvested irrigated permanent crop area: Oil palm	D	V	A	X
227	D	D6	4364. Harvested irrigated permanent crop area: Coffee	D	V	A	X
228	D	D6	4365. Harvested irrigated permanent crop area: Tea	D	V	A	X
229	D	D6	4363. Harvested irrigated permanent crop area: Cocoa beans	D	V	A	X
230	D	D6	4522. Harvested irrigated permanent crop area: Grass and Fodder	D	V	A	X
231	D	D6	4368. Harvested irrigated permanent crop area: Rubber	D	V	A	X
232	D	D6	4378. Harvested irrigated permanent crop area: Other crops	D	V	A	X
233	D	D6	4329. % of total grain production irrigated	D	V	A	X
234	D	D7	4410. Irrigated crop yield: Wheat	I	V	A	
235	D	D7	4411. Irrigated crop yield: Rice	I	V	A	
236	D	D7	4412. Irrigated crop yield: Barley	I	V	A	
237	D	D7	4413. Irrigated crop yield: Maize	I	V	A	
238	D	D7	4414. Irrigated crop yield: Millet	I	V	A	
239	D	D7	4415. Irrigated crop yield: Sorghum	I	V	A	
240	D	D7	4416. Irrigated crop yield: Other cereals	I	V	A	
241	D	D7	4417. Irrigated crop yield: Potatoes	I	V	A	
242	D	D7	4418. Irrigated crop yield: Sweet potatoes	I	V	A	
243	D	D7	4419. Irrigated crop yield: Cassava	I	V	A	
244	D	D7	4420. Irrigated crop yield: Other roots and tubers	I	V	A	
245	D	D7	4421. Irrigated crop yield: Plantains	I	V	A	
246	D	D7	4422. Irrigated crop yield: Sugar cane	I	V	A	
247	D	D7	4423. Irrigated crop yield: Sugar beet	I	V	A	
248	D	D7	4424. Irrigated crop yield: Pulses	I	V	A	
249	D	D7	4425. Irrigated crop yield: Vegetables	I	V	A	
250	D	D7	4426. Irrigated crop yield: Bananas	I	V	A	
251	D	D7	4427. Irrigated crop yield: Citrus	I	V	A	
252	D	D7	4428. Irrigated crop yield: Cocoa beans	I	V	A	
253	D	D7	4429. Irrigated crop yield: Coffee	I	V	A	
254	D	D7	4430. Irrigated crop yield: Tea	I	V	A	
255	D	D7	4431. Irrigated crop yield: Tobacco	I	V	A	
256	D	D7	4432. Irrigated crop yield: Cotton	I	V	A	
257	D	D7	4433. Irrigated crop yield: Rubber	I	V	A	
258	D	D7	4434. Irrigated crop yield: Fodder	I	V	A	
259	D	D7	4435. Irrigated crop yield: Oil palm	I	V	A	
260	D	D7	4436. Irrigated crop yield: Soybeans	I	V	A	
261	D	D7	4437. Irrigated crop yield: Groundnuts	I	V	A	
262	D	D7	4438. Irrigated crop yield: Sunflower	I	V	A	
263	D	D7	4439. Irrigated crop yield: Sesame	I	V	A	
264	D	D7	4440. Irrigated crop yield: Coconuts	I	V	A	
265	D	D7	4441. Irrigated crop yield: Flowers	I	V	A	
266	D	D8	4303. Area equipped for irrigation drained	D	V	A	X
267	D	D8	4304. Non-irrigated cultivated area drained	D	V	A	X
268	D	D8	4300. Total cultivated area drained	D	C	C	
269	D	D8	4446. % of area equipped for irrigation drained	D	C	C	
270	D	D8	4305. % of total cultivated area drained	D	C	C	
271	E	E1	4454. Conservation agriculture area	D	V	A	X
272	E	E1	4455. Conservation agriculture area as % of arable land area	D	C	C	
273	E	E2	4306. Water harvesting area	I	V	A	
274	F	F1	4400. Area salinized by irrigation	D	V	A	X
275	F	F1	4445. % of area equipped for irrigation salinized	D	C	C	
276	F	F1	4401. Area waterlogged by irrigation	D	V	A	X
277	F	F1	4543. Flood occurrence (WRI)	D	V	A	X
278	F	F2	4114. Total population with access to safe drinking-water (JMP)	D	V	O	
279	F	F2	4115. Rural population with access to safe drinking-water (JMP)	D	V	O	
280	F	F2	4116. Urban population with access to safe drinking-water (JMP)	D	V	O	
281	F	F3	4403. Population affected by water related disease	D	V	A	X

2.5.2. Quantity of variables and indicators by sub-category and detailed legend

Column C in table of section 2.5.1	Sub-category	
A1	Land use	5
A2	Population	9
A3	Economy, development and food security	7
B1	Precipitation	3
B2	Internal renewable water resources	6
B3	External renewable water resources	17
B4	Total renewable water resources	6
B5	Exploitable water resources and dam capacity	9
C1	Water withdrawal by sector	30
C2	Water withdrawal by source	24
C3	Groundwater depletion	3
C4	Wastewater	14
C5	Pressure on water resources	4
D1	Area under agricultural water management	22
D2	Area equipped for irrigation by source of water	14
D3	Power irrigated area	2
D4	Irrigation schemes by size	3
D5	Investments in irrigation	10
D6	Irrigated crop area and cropping intensity	45
D7	Irrigated crop yield	32
D8	Drainage	5
E1	Conservation agriculture	2
E2	Water harvesting	1
F1	Environment	4
F2	Access to improved drinking water sources	3
F3	Health	1
TOTAL		281
Column E:	D = Disseminated to external users	182
	I = Internally available to AQUASTAT only	99
Column F:	V = Variable	216
	C = Calculated variable/indicator	65
Column G:	A = Collected by AQUASTAT	195
	O = Taken from other agencies	21
	C = Calculated	65
Column I:	Criteria = D [column I] + V [column J] + A [column K]	111

2.5.3. Summary with quantities by category

Category	D	I	V	C	A	O	C	D/V/A	
Geography and population	21	16	5	14	7	0	14	7	0
Water resources	41	40	1	26	15	22	4	15	21
Water use	75	31	44	57	18	57	0	18	20
Irrigation and drainage development	133	85	48	110	23	110	0	23	65
Conservation agriculture and water harvesting	3	2	1	2	1	2	0	1	1
Environment and health	8	8		7	1	4	3	1	4
	281	182	99	216	65	195	21	65	111

3. Other tasks directly related to the Main Database

3.1. Uploading data and metadata

AQUASTAT CSV-Maker on the **Divisional shared drive** is located under:

<\\...\\AQUASTAT\\Bulk downloads-uploads\\0-CSV makers>

AQUASTAT internal database, the **AQ Working System**, to upload CSV is located under:

<http://www.fao.org/nr/water/aquastat/work/edit/cupload.html>

3.1.1. Use of the edit screen

Inserting/Updating/Deleting one or a few data and metadata can be done manually by using the “Edit” button in the WS. The variable/country/period where a change is needed is selected and then when pushing the “Edit” button on either the Query page (bottom) or the Results page (top right) a page opens that contains many more variables and indicators than the one wanting to change. The reason is that changing the value of that variable might have influence on other variables/indicators (through calculation and validation rules), so also those have to go again through the validation process. When clicking on the cell with the value wanting to insert/update/delete, a window pops up which is self-explanatory.

While inserting/updating/deleting data and metadata for one or a few variables can be easily done through the “edit” screen, a larger number of data and metadata can be more easily uploaded by using the CSV-maker as explained below.

3.1.2. Use of the CSV-Maker for uploading data and metadata

The CSV-maker (file name: 1.CSV maker – rev.xx.xls) is used to prepare CSV files with data and/or metadata that can be subsequently uploaded in the AQUASTAT database through the WS. The file has two sheets: the “CSV-MAKER” sheet where the data has to be filled in (bullet points 1-10 below), and the “Legend” sheet (bullet point 11).

Instructions and notes on how to fill in the CSV-Maker file:

1 - Country name (Column A): The country name has to be put in English, using exactly the same name as in the AQUASTAT database. Subnational regions can also be put.

2 - Country code (Column B): The country code will be put automatically when clicking on the “**Check first!**” button. If a country name has not been written correctly a window will appear showing the wrong names, and no code will be put for these countries. These wrong names have to be corrected, and subsequently press again “**Check first!**” until no window appears. Country codes can also be put manually, but it would take longer.

For subnational regions, the country code can only be put manually. The button “**Check first!**” must not be pressed, because the subnational names are not recognized and would give an error.

3 - Variable code (Column C): The variable code can be found in the AQUASTAT database by clicking the button “Show codes” at the bottom of the query page. They are also given in section 2.2.

4 - Year (Row 2, Columns from D onwards): It’s only necessary to put the years that have data and/or metadata. Other years with no data can also be put, but will not appear in the CSV file.

5 - Data (Rows from 3 onwards, Columns from D onwards): To put the new values for each country/variable/year.

6 - Qualifiers: If a qualifier is needed, the corresponding colour of that qualifier has to be put in the same cell of the value. The colours of the qualifiers are shown in Row 1-Column F-K. The explanation of each qualifier is available in the “Legend” sheet.

7 - Source: If decided to put the source for all the values in the CSV file, the box next to “**Source_IDs here?**” has to be ticked. Then, a source ID has to be assigned to each value by clicking on the button “**Source_ID**” (note: be sure to be positioned on the correct value cell). To put the same source for different cells, all those cells have to be selected before clicking on “**Source_ID**”. If decided to not put the source in the CSV file, the box next to “Source_IDs here?” should be left unticked (empty).

8 - Metadata: 1 to 6 metadata can be added to each cell (with data or without data, also cells without data can have metadata) by clicking on the button: “View/edit” (note: be sure to be positioned on the correct value cell). Steps: (i) assign visibility, stickiness, category; (ii) write the metadata; (iii) check and accept. To put the same metadata for different cells, all those cells need to be selected before clicking on “View/edit”.

9 - Check first: It is recommended to click this button before creating the CSV files (GO! Button). It does some tests and notifies in case there is any problem. To see the different tests done with this button go to the “Legend” sheet.

Note: *Make sure there are NO empty rows in between country/variable combinations. It will stop loading sources and metadata if there are.*

10 - GO! This bottom will create 2 CSV files: one with Data and one with Metadata (even if there is no metadata, this file will be created).

An automatic name will be assigned to the file: “CSV -DESCRIPTION_HERE- 2015.07.08”. Put a description in “DESCRIPTION_HERE”. The file with data will be: “CSV -DESCRIPTION_HERE- 2015.07.08- DATA.csv”, and the file with metadata will be: “CSV -DESCRIPTION_HERE- 2015.07.08- MD.csv”. These CSV files can be uploaded in the database.

First line: in the first line of the CSV it can be seen how many countries (column B) and variables (column C) are in the CSV file. Column D gives the multiplication of column B x column C. If this multiplication gives a value larger than 6 000 the CSV file should be split before uploading it (Note: 6 000 is an average number; in some cases, depending on the variables, countries, and years, it could be necessary to split the CSV with less or with more than 6 000).

11 - Legend sheet: The legend sheet shows:

- Explanation of qualifiers
- Explanatory notes
- Tests done when clicking on “**Check first!**”

- Format of the .csv file structure
- Changes made in each new CSV maker version

12 - Uploading CSV files: Upload the data and metadata CSV files in the database through this page <http://www.fao.org/nr/water/aquastat/work/edit/cupload.html>.

13 - Storing CSV files: If the files refer to one county, store it in the CSV upload folder of the country concerned in [\\...\AQUASTAT\Country survey](#). If it refers to bulk uploads, store it in the corresponding folder here [\\...\AQUASTAT\Bulk downloads-uploads\](#).

3.1.3. Monitoring data and metadata actions

A “Monitoring Data and MD points 2016” Excel file has been created in March 2016 to keep track of actions undertaken in the database for evaluation purposes. The file has a “Data &MD” sheet where the data and metadata added, deleted and updated are put for each country. The file is available in the folder [\\...\AQUASTAT\Database issues](#).

3.1.4. Monthly database reports

During 2014-2015 monthly database reports were prepared using R. They can be found in the folder [\\...\AQUASTAT\Database issues\DB monthly reports](#). These reports give interesting insights on what variables are most queried, what countries, where the users come from, how the queries are done. One interesting outcome is that over 20 percent of the database queries are from countries querying the data for their own country, which also indicates its usefulness for the countries themselves.

3.2. Uploading metadata

Read the document “Contextual metadata in the AQUASTAT database” for detailed information and understanding of the metadata in AQUASTAT (<http://www.fao.org/3/a-bc819e.pdf>).

3.2.1. Procedure for inserting, updating, deleting many metadata

1. Open the WS <http://www.fao.org/nr/water/aquastat/work/query/index.html>.
2. Open the “Metadata Query/Edit/Add” page <http://www.fao.org/nr/water/aquastat/work/metadata/addMetadata.html> from the AQUASTAT WS dropdown menu. **NOTE:** this link cannot be opened directly, first the link under bullet point 1 has to be opened, because there are some elements that need to load from there. If not done like that, it will give the message:
An error has occurred.
`javax.servlet.jsp.JspException: javax.el.ELException: Problems calling function 'fc:isNodeSelected'`
3. Select the variable/s, country/ies, year/s concerned and push the Submit button.
4. Download CSV of Results page
5. Open the Upload CSV page from the AQUASTAT Working System dropdown menu <http://www.fao.org/nr/water/aquastat/work/edit/cupload.html>
6. Rearrange the downloaded CSV file to be the same as shown there, which means deleting and inserting the following columns from and to the CSV: Delete Variables name; Insert Source_ID;

Delete Category; Sequence in web page = MdlId column in CSV file; In a new column after the MdlId column add the operation to do, which means D for deletion (I for insert and U for update)

7. Save the CSV file and upload it on <http://www.fao.org/nr/water/aquastat/work/edit/cupload.html>.
8. Before pushing the “Upload” button, tick the box “Metadata mode” at the bottom.
9. After pushing “Upload”, it goes to an ‘md validation’ screen. Here, the activity specified should be selected, there is also the option to change the action when seeing ALL the md available, but it’s not mandatory. The md will be coloured red (non-sticky) or blue (sticky)... and the stickiness can be changed on this page.

Note: Deletion of many metadata might be needed when for example external MD were put for a variable for all periods or years, such as a variable from another organization. This would then give all green, which is not pleasant. In that case, it is better to add a comment in the definition of the glossary. Example: the following external MD were put for all years for the undernourishment variables [4473] and [4474] “Year put refers to last year of 3-year period”. Instead of putting it there, it was moved to the bottom of the definition in the glossary, see the metadata in the glossary term <http://bit.ly/2g6KcNr>.

3.2.2. Procedure for deleting, inserting, updating metadata one by one

To insert/update/delete metadata one by one, this can be done directly from the “Metadata Query/Edit/Add” page.

3.3. Updating wastewater data

Wastewater data updates are done in collaboration with the CGIAR Research Programme on Water, Land and Ecosystems, led by the International Water Management Institute (IWMI), through Javier Mateo-Sagasta (J.Mateo-Sagasta@cgiar.org). See web page <http://www.fao.org/nr/water/aquastat/wastewater/index.stm> for more information.

The latest update was done in October 2016 and the files are available in the folder “2016.09.15 submission from Javier and analysis”, located in:
<\\...\\AQUASTAT\\Wastewater - Water quality\\Wastewater\\>

The file “AQ-DB-WW-AllData+MD_20160916.xlsx” is a download from the WS before this latest update in October 2016.

The file “IWMI Worksheet AQ Final with Validation Value check.xlsm” is the latest file submitted, which has been quality-checked by AQUASTAT.

The data and metadata have then been uploaded in the database and the file “AQ-DB-WW-AllData+MD_20160928.xlsx” compares the results by variable before (yellow tabs=20160916) and after (blue tabs=20160928) and has one sheet “Summary All” for the total.

The website shows a flowchart with the variables available in the Main Database, see http://www.fao.org/nr/water/aquastat/wastewater/flowchart_eng.pdf. As soon as more variables become available in the database, this flowchart has to be updated, as well as the links to the

variables on the website in the section “Topical glossary”

<http://www.fao.org/nr/water/aquastat/wastewater/index.stm#glossary>.

A pending issue is the updating of the Report “Global database on municipal wastewater production, collection, treatment, discharge and direct use in agriculture”, which has to be done by IWMI. The one now available online (<http://www.fao.org/3/a-bc823e.pdf>) was prepared BEFORE the major update undertaken in 2016.

Another issue, which becomes important also within the framework of monitoring SDG 6.4.1, is to review the direct use of (treated and/or untreated) wastewater and what should be included. For the moment AQUASTAT, in agreement with IWMI, only considers direct use of municipal wastewater as the above flowchart shows and as explained on the wastewater web page <http://www.fao.org/nr/water/aquastat/wastewater/index.stm>. In the future, direct use of industrial wastewater might need to be included (to be checked with SDG 6.3.1). Also, the issue of freshwater withdrawal, which includes both primary freshwater and secondary freshwater (discharged treated or untreated wastewater, discharged agricultural drainage water), might need to be revisited. For this moment, secondary freshwater withdrawal is included in freshwater withdrawal since no distinction can be made between the withdrawal of primary and secondary freshwater. However, in renewable freshwater resources only primary freshwater is being considered. This, amongst others, might give values for pressure on freshwater resources (variable 4275) higher than 100%.

3.4. Preparation of a parametrized search

3.4.1. Preparation of a parametrized search for database variables

1. Go to the dissemination query page in the language required for example for English:
<http://www.fao.org/nr/water/aquastat/data/query/index.html?lang=en>
2. Select the variables and countries and the other options needed, but DO NOT press the Submit button
3. Press F12
4. Go to “Network”
5. Press the “Submit” button on the query page
6. In “Network”, select “results. html”
7. Go to “headers”
8. Scroll down till “Form data”
9. Click “View source”
10. Select all and copy
11. In the results page <http://www.fao.org/nr/water/aquastat/data/query/results.html> put ? after html and add the part copied from “View source”
12. This is the new link that can be put on the website for the button “Go to database”
13. Change query_type=querypage to query_type=XXXpage where XXX is whatever you want it to look like in the DB report. This means: Geo for geography, WR for water resources, WU for Water uses, IRR for Irrigation and drainage, MPL for Management, policies, legislation, WasteW for wastewater.
14. At the end of the link add: &lang=xx, where xx=en for English, fr for French and es for Spanish.

3.4.2. Preparation of a parametrized search for glossary terms by subject

The same procedure should be followed to create glossary by subject on for the theme pages.

Or:

An existing glossary term can be chosen, for example from the wastewater page

<http://www.fao.org/nr/water/aquastat/wastewater/index.stm> and changes made in the link.

For example, if we want to have flood occurrence, we can take the link for produced wastewater:

```
../data/glossary/search.html?lang=en&_p=100&submitBtn=-1&keywords=Produced+municipal+wastewater&subjectId=-1&termId=-1&submit=Search
```

and we change to:

```
../data/glossary/search.html?lang=en&_p=100&submitBtn=-1&keywords=Flood+occurrence&subjectId=-1&termId=-1&submit=Search
```

If we need to change the language, we put “en” for English, “es” for Spanish and “fr” for French in: lang=xx

3.5. AQUASTAT and FAOSTAT (ESS)

AQUASTAT-FAOSTAT comparison files and folders on the *Divisional shared drive* are located under: <\\...\\AQUASTAT\\FAOSTAT issues>

3.5.1. Irrigation-related variables in AQUASTAT and FAOSTAT

Two variables exist in the FAOSTAT database <http://www.fao.org/faostat/en/#data/RL> that are somehow similar to AQUASTAT variables:

1. AEI: The Item “**Total area equipped for irrigation**” in FAOSTAT is exactly the same as the Variable [4313] “**Area equipped for irrigation: total**” in AQUASTAT.
2. AAI: The Item “**Agricultural area actually irrigated**” in FAOSTAT is comparable to variable [4318] “**Area equipped for irrigation: actually irrigated**” in AQUASTAT. The fact that FAOSTAT calls it “Agricultural area” is logical, because also irrigated permanent meadows and pastures would be included, which are not part of arable land and permanent crops. Therefore it is not 100% correct that AQUASTAT uses the variable [4331] “% of the cultivated area equipped for irrigation”, because in AQUASTAT the variable [4103] “Cultivated area” is equal to the sum of arable land and permanent crops and does not include meadows and pasture, while the variable [4313] would include the area equipped for irrigation of permanent meadows and pasture. It would be more correct to use % of agricultural land actually irrigated, but in general agricultural area is huge compared to cultivated area, because of the huge areas of permanent meadows and pasture in most countries, which also in most countries are not irrigated. Using this would thus always give a very low percentage. However, to have an idea of the situation and the what is the irrigated permanent pastures and meadows area available in AQUASTAT, one can check the latest value of variable [4522] “Harvested irrigated permanent crop area: Grass and Fodder”. In

December 2016, information was available for 21 countries. These values could then be compared with both the cultivated area [4103] and the Item “Agricultural area” in FAOSTAT to see the difference and make adjustments if wanted.

Once a region has been updated by AQUASTAT, it prepares an Excel file in which the following information is put for each country:

- AEI AQUASTAT: year and value
- AEI FAOSTAT: year and value
- AEI FAOSTAT: year and flag
- AAI AQUASTAT: year and value
- AAI FAOSTAT: year and value
- AAI FAOSTAT: year and flag

While FAOSTAT has a full database for AEI but not for AAI, AQUASTAT has neither for AEI nor for AAI a full database.

In the cases that the flag used in FAOSTAT is Fm for AEI, it means that FAOSTAT has manually estimated the value to be able to interpolate or extrapolate to fill up the database. If it is a year for which AQUASTAT managed to get a value and a source/reference, which is different from the manual estimate done by FAOSTAT, it can be possible that FAOSTAT adjusts its value for that specific year to be equal to the AQUASTAT value and then does again the interpolation and extrapolation.

In most cases it is possible to harmonize the AQUASTAT and FAOSTAT data, in a few cases it has been agreed to disagree.

Example files can be accessed from the shared drive mentioned at the beginning of section 3.5.
Contact point in FAOSTAT: Giorgia De Santis.

3.5.2. Water-related variables in FAOSTAT taken from AQUASTAT

Water is not very visible in FAOSTAT due to the fact that it is considered that AQUASTAT deals with it. This is correct, but a clear link to ASQUASTAT, which was available in the previous version of FAOSTAT, is not available anymore. AQUASTAT is only mentioned in the definitions and metadata sheets of the water page <http://www.fao.org/faostat/en/#data/EW> (button at bottom right) and even without putting the link to the AQUASTAT database in the metadata sheet. Moreover, in general people don't check those sheets, they instead want to see straight away the data and then notice that there is hardly anything on water. A discussion between AQUASTAT and FAOSTAT on how to make AQUASTAT more visible should take place. Once the Statistical Working System (SWS) implemented (see section 8.3), this will become less of an issue.

For the moment there is one water-related variable in the water section of Agri-Environmental indicators: <http://www.fao.org/faostat/en/#data/EW>. It is called Item “water withdrawal for agricultural use” and element “% of total water withdrawal” and is equal to AQUASTAT's variable [4254] “**Agricultural water withdrawal as % of total water withdrawal**”. However, for the moment this is not always up-to-date in FAOSTAT, because there is no direct link, but from time to time a CSV file is downloaded from AQUASTAT to be uploaded in FAOSTAT. This is a problem, because AQUASTAT regularly updates a value and not just once a year. This problem should disappear once the Statistical Working System (SWS) is working (section 8.3). It is also hoped that then water becomes more prominently visible also in FAOSTAT, while acknowledging AQUASTAT.

3.5.3. Land- and population-related variables in AQUASTAT taken from FAOSTAT

AQUASTAT takes three land-related and two population-related variables from FAOSTAT:

- Variable [4100] "Total area of the country"
- Variable [4101] "Arable land area"
- Variable [4102] "Permanent crops area"
- Variable [4104] "total population"
- Variable [4106] "urban population"

While during FAOSTAT 1, there was a direct link between FAOSTAT and AQUASTAT, this disappeared during FAOSTAT 2 and from then onwards, AQUASTAT checks from time to time updates in FAOSTAT (which are normally done once or twice a year) and then downloads a CSV file, which it uploads in AQUASTAT. Doing this, not only new, more recent years should be added, but the entire period from 1961 should be uploaded again, because it also can happen that FAOSTAT makes changes somewhere in the period due to data corrections. Once the Statistical Working System (SWS) functional, a direct link can be established again (section 8.3).

3.6. AQUASTAT and the Information Technology Division (CIO)

Since its start AQUASTAT works with the CIO (and its predecessors AFI, KCE, etc.) for the improvement, enhancement and debugging of the AQUASTAT Main Database, the Multilingual Glossary and the Institutions Database.

Some still pending issues are summarized below, downloaded from JIRA. Those tasks, mainly improvement, bugs and enhancement, have not yet been undertaken due to resource constraints. These were just pending ideas at that moment and **by no means** represent all that could be done to improve and enhance the AQUASTAT Database.

CIO - FAO of the UN

Project: AQUASTAT

Displaying 50 issues at 15/Nov/16 10:31 AM.			
Issue Type	Summary	Description	Status
Task	Modify Institutions db	Please modify institutions db as per the attached file. Columns not in the file should be removed.	Open
Bug	Improve csv rejection message	Uploading the attached csv file provides the following message: : Invalid input format (SourceID is not valid): 5 line:137: Line: 191 Col: 0 Where the problem is that in line 137 (138 really) there is a space in the number. The error message should be improved.	Open
Bug	Change text on csv upload page	There are some inconsistencies on the instructions on the csv upload page that are not BLOCERS, but annoying. Please make the modifications as per the attached image.	Open
Bug	Column and row headers should be visible while scrolling in db result screen[ws][ds][db results page, db edit page]	Original description: In database edit view, the column and row headers are not persistent on the screen (i.e. as you scroll down and to the right, they disappear from view. Once we find the data we want, we have to scroll back to the top (or to the right) to see the corresponding year. Discuss different options... maybe using a separate frame. So specific tasks: 1) Fix the column title css when years are column headers	In Progress



		2) Apply the column header lock on Main db Results screen, Edit screen (and other tables if easy). > However, in the Main db Results screen, the top should not be locked if "Suppress Rows/Columns" is TRUE (selected on the query page).	
Bug	Source db pagination broken in IE 11	When you search for example for AQUASTAT as a Keyword, you get several pages of result. When I am on the 1st result page and want to push the button 2/3/Next to see the following pages, all the result disappear and I'm back at the initial source reference page. Discussing with Amit this afternoon, it seems this bug is only in IE v.11, not v.8 though. And it works well in Chrome also.	Open
Task	See if Water Resources workflow can be improved by Time estimate only	The process of WR Point db -> Matrix -> database depends heavily on excel, macros, and quite some manual labour. Some of this work can be sped up and simplified by introducing some IT tools, for example Talend. At a certain point, AQ and CIO will sit together to discuss what exactly is done, and how CIO can help. For now, the work is only to discuss the possibilities.	Open
Improvement	Update the Java library on the KWIP in order to improve the bounding boxes	The KWIP is currently using an outdated version of the Java library. Updating to the latest version allows for several improvements, although the one most interesting to us at the moment is to have more realistic bounding boxes drawn around countries that lie along the west border of the world (presently these show bounding boxes that span the world since there's a little bit of the country on the east edge of the world). Also, Sudan doesn't trigger a map-reposition.	Open
Task	Improve source download and search by ID	In the SOURCE page, we have the ability to "Download Source db .csv", but this file doesn't contain the new fields (LINK & FILENAME). Please include these to the button. Please allow the KEYWORD SEARCH feature to also check the ID column for hits (it doesn't matter that false positives will be entered). What we are looking for is the ability to do a search by ID also.	Open
Task	make AQUASTAT mobile-friendly![ds]	Make database functional via mobile devices, including browsing and/or downloading data.	Open
Task	Two different views for database, Indicators, Variables, both [db query page][ds]	(B2) ½ Checkboxes to show indicator (var with division or multiplication formula) only, variables only, or both.	Open
Task	Change db units for km3 to 1000 m3 (Includes conversion)[ws][ds]	Change all km3 and 10 ⁹ m3 to million m3. This implies also multiplying all values in db with 1000.	Open
Bug	Exception if sum option is selected in WS	Exception thrown if a user try to download CSV Flat, without error message: 27: <number>\${val.value}</number>, 28: <text>\${val.symbol}</text>, 29: <text><c:if test="\${cell.hasMetadata}"><c:forEach items="\${cell.metadata}" var="metadatum" varStatus="idx" >\${idx.count+count}<c:if test="\${idx.count!=fn:length(cell.metadata)}">,</c:if></c:forEach></c:if></text>, 30: <text><c:if test="\${val.source!=null}">\${val.source.id}</c:if></text> 31: </row> 32: <c:set var="count" value="\${count+fn:length(cell.metadata)}"/> 33: </c:if>	Open

		<pre> Stacktrace:] with root cause javax.el.PropertyNotFoundException: Property 'source' not found on type org.fao.aquastat.model.AqsAggregateValue at javax.el.BeanELResolver\$BeanProperties.get(BeanELResolver.java:223) at javax.el.BeanELResolver\$BeanProperties.access\$400(BeanELResolver.java:200) at javax.el.BeanELResolver.property(BeanELResolver.java:311) at javax.el.BeanELResolver.getValue(BeanELResolver.java:85) at javax.el.CompositeELResolver.getValue(CompositeELResolver.java:67) at org.apache.el.parser.AstValue.getValue(AstValue.java:169) at org.apache.el.parser.AstNotEqual.getValue(AstNotEqual.java:38) at org.apache.el.ValueExpressionImpl.getValue(ValueExpressionImpl.java:189) at org.apache.jasper.runtime.PageContextImpl.proprietaryEvaluate(PageContextImpl.java:985) at org.apache.jsp.WEB_002dINF.jsp.views.query.flatcsv_jsp._jspx_meth_c_005fif_005f4(flatcsv_jsp.java:727) at org.apache.jsp.WEB_002dINF.jsp.views.query.flatcsv_jsp._jspx_meth_c_005fif_005f0(flatcsv_jsp.java:549) at org.apache.jsp.WEB_002dINF.jsp.views.query.flatcsv_jsp._jspx_meth_c_005fforEach_005f2(flatcsv_jsp.java:454) at org.apache.jsp.WEB_002dINF.jsp.views.query.flatcsv_jsp._jspx_meth_c_005fforEach_005f1(flatcsv_jsp.java:384) at org.apache.jsp.WEB_002dINF.jsp.views.query.flatcsv_jsp._jspx_meth_c_005fforEach_005f0(flatcsv_jsp.java:313) at org.apache.jsp.WEB_002dINF.jsp.views.query.flatcsv_jsp.access\$0(flatcsv_jsp.java:286) at org.apache.jsp.WEB_002dINF.jsp.views.query.flatcsv_jsp\$Helper.invoke0(flatcsv_jsp.java:1339) at org.apache.jsp.WEB_002dINF.jsp.views.query.flatcsv_jsp\$Helper.invoke(flatcsv_jsp.java:1407) at org.apache.jsp.tag.web.common.formatCsv_tag.doTag(formatCsv_tag.java:69) at org.apache.jsp.WEB_002dINF.jsp.views.query.flatcsv_jsp._jspx_meth_fao_005fformatCsv_005f0(flatcsv_jsp.java:281) at org.apache.jsp.WEB_002dINF.jsp.views.query.flatcsv_jsp._jspService(flatcsv_jsp.java:125) at org.apache.jasper.runtime.HttpJspBase.service(HttpJspBase.java:70) at javax.servlet.http.HttpServlet.service(HttpServlet.java:722) at org.apache.jasper.servlet.JspServletWrapper.service(JspServletWrapper.java:433) at org.apache.jasper.servlet.JspServlet.serviceJspFile(JspServlet.java:389) </pre>	
Bug	MD no colour cell	<p>Why is this cell not green while there is md (while it shows up when doing "Suppress empty rows and columns")?</p> <p>Maybe this has to do with the problem I mentioned before (no year for MD indicated when latest value is selected, which has to be solved)?</p>	Open
Task	Add the receipt generation for the unsuccessful loading	When the "save all " action is called the receipt must be generated in any case (positive / negative)	Open



Task	Auto-switch axes to facilitate db operation for users [db query page][ds]	In COUNTRIES view, assign dimensions to axes based on how many entries are picked within each dimension. Most entries = y-axis; second most = x-axis; least entries = z-axis. Maybe? AK and KF don't agree!	Open
Task	Alternate query page for journalists	This will be a simple page, with very few selection criteria. Additional details to be furnished.	Open
Task	Document changes implemented on AQUASTAT db / KWIP		In Progress
Task	Finalize ETL job[publish page][ws]	Finalize ETL job from AQ db -> FWMS (publishing)	In Progress
Task	Change database symbol K to G [ds][ws]	Change the K symbol to GK can be confused with thousands. Ask Gianluca about data.fao.org protocol, and to think about.	Open
Bug	exception If add Metadata page is opened without passing from home	If the page http://hqlqatomc04.hq.un.fao.org:8011/nr/water/aquastat/work/metadata/addMetadata.html is opened without passing from query page, an error page is shown.	Open
Bug	Fill column headers on table csv download. [DS]	Table .csv downloads have 3 "helper" columns per column (year, symbol, md). We would like the header columns to be filled in. Evaluate costs for 2 options: 1) Simply filling in the same heading for however many columns or 2) To refer to each column heading... so for example, if my columns are 1988-1992 and 1993-1997, helper column headings should be: 1988-1992 year 1988-1992 symbol 1988-1992 md 1993-1997 year 1993-1997 symbol 1993-1997 md	In Progress
Epic	Re-design saved queries	Saved Queries need several modifications, added as subtasks.	Open
Epic	Upload source files per se (with hyperlink), as well as the info for the JH specific to the specific upload exercise		Open
Task	Allow variables to become STABLE	This is to prevent the need of uploading data and metadata to each year all the time. Not only does this require significant time to enter data/metadata into each year, but also unnecessarily clogs database with duplicate information, and in some cases it's not even appropriate to have yearly values. Therefore, propose to use the "Latest value" feature of AQUASTAT in the following way: If a variable is marked as "STABLE" (in the variable screen), it will always display the latest value in every time period requested, as long as the requested period is chronologically after the value. This way, the latest value of data would be available. If any data should be available for all periods, then will be entered into 1960, that way they would always be available while requiring minimum data/metadata to be entered.	Open



		A potential complication would be how to make calculations refer to this fake value correctly, for example, water resources per capita? To be solved.	
Epic	Create Journal Histories through which changes to variable names, definitions, calc/val rules, institutions, etc will be tracked.		Open
Epic	All efforts to create a db through which descriptive metadata can be assigned to data-points		Open
Sub-task	AQUASTAT-65 Journal History for Institutions db [ws]	Create a Journal History that tracks changes to the Institutions db. No UI required, saving changes to a log file will be sufficient.	Open
Task	General Task - Analysis, Planning, Meeting and Investigation		Open
Sub-task	AQUASTAT-65 Journal Histories for validation rules - Analyze / DB implementation	Validation rules Table - Each Delete/New/Update activity must be recorded in the journal history(validation rules)	Open
Sub-task	AQUASTAT-65 Journal Histories for validation rules - Query / Result page	The query page on the journal history (variable): - comment - user - validation info The result page: What fields could be shown (Validation info, Variable set, etc)	Open
Sub-task	AQUASTAT-65 Journal Histories for variables - Analyze / DB implementation	Variable Table Each Delete/New/Update activity must be recorded in the journal history(VARIABLE)	Open
Sub-task	AQUASTAT-65 Journal Histories for variable - Query / Result page	The query page on the journal history (variable): - comment - user - variable number The result page: What fields could be shown (Variable Group, Variable Name, etc)	Open
Sub-task	AQUASTAT-65 Journal Histories for Calculation rules - Query / Result page	The query page on the journal history (Calculation rules): - comment - user - variable number The result page: What fields could be shown (Expression, VARIABLE_ID, primary_variables)	Open
Sub-task	AQUASTAT-65 Journal Histories for calculation rules - Analyze /	Calculation rules Table - Each Delete/New/Update activity must be recorded in the journal history(calculation rules)	Open



	DB implementation		
Sub-task	AQUASTAT-65 Journal Histories for glossary - Query / Result page	The query page on the journal history (GLOSSARY): - full search on those fields - comment - user The result page: What fields could be shown (terms, description, action, category changes, source changes, related term changes, etc....)	Open
Sub-task	AQUASTAT-65 Journal Histories for glossary - Analyze / DB implementation	Glossary Table - the Aq Glossary uses the reference table for the source and category Each Delete/New/Update activity must be recorded in the journal history(GLOSSARY)	Open
Task	Journal Histories for other AQ areas	Create journal histories for: > glossary > calculation rules > variable names > validation rules	Open
Task	Improve Water Resource Sheet (WRS) - Obtain water resource text from country profiles and put on WRS.	The country profiles for each country have been broken up into sections, and are available online as such. Considering this, during the generation of the WRS pdfs, you should include this link on pg. 2: http://www.fao.org/nr/water/aquastat/countries_regions/AFG/AFG-WR.htm (Where AFG is the ISO3 for each country). If the link for some reason doesn't return anything, then the error message "No Water Resource text available for the selected country".	Open
Bug	Global irrigation map	Any reference to Geonetwork 3 must be removed and service migrated, so present URL http://www.fao.org/nr/water/aquastat/quickWMS/irrimap.htm should be replaced with a call to a gif - check if that gif already exists in geoserver.	Open
Bug	Climate Information Tool	The climate information dataset with the interactive map and query page must be migrated from geonetwork to geoserver server and got the details from the Aquastat Database	Open
Task	Increase source- title field character limit[Sources db][ws]	Change the field for Source titles to be greater than 256 (from VARCHAR to TEXT) in order to accommodate large titles (with the link anchor which is already around 100 characters)	Open
Task	Show data insertion source on result page popup [result page][ws]	Clicking on a data point in the database view (working system) will also show if the data has been inserted via a csv upload, questionnaire upload, or direct modification using the edit screen. Unsure of real date contract= Jan-July 2010	Open
Task	Allow text entry in edit screen [Sources db][edit screen][ws]	Modify edit screen popup box allowing users to enter "comments" directly for each cell.	Open
Task	Gather dynamic data for JH on data/md entry [Sources db, csv upload, edit screen, metadata][ws]	Provide a screen preceding the Edit screen that would gather dynamic information about that data upload exercise and write it to the JH. Comments would be put in the COMMENTS column, and the rest of the information would be combined and placed in the SOURCE DESCRIPTION column.	Open
Bug	Display correct metadata language	The system is set up so that when metadata is not available in other languages but users are performing queries in other languages, the English metadata should be shown. The bug is that now the English metadata is shown EVEN IF the metadata is present in the appropriate language. This should be corrected.	Open



		Note... this is a problem only with the display, downloaded .csv files contain the correct information. For an example, please see Albania 4100 2002. Metadata should be present in all languages, and yet it's not displayed correctly.	
Bug	OM still uses old source[edit page][ws]	OM uploads when .csv file includes sources still uses old source (not new)	Open
Task	Allow future years in db[ws]	FOR INTERNAL USE: to have future years (for example till 2050) in the working system, but not in the dissemination system. This might be useful within the framework of our work related to global perspective studies. Discuss the possibility of assigning a data qualifier to qualify data that comes from a perspective study.	Open
Task	scale dissemination page to window size[db query page][ds][ws]	10. When the database query page is called from the AQUASTAT website, it opens a new window of size 800 x 600. If the user increases the window size, the script stays the same size. It would be better if the script changed size depending on the size of the window (the script would never get smaller depending on window size, but larger). Therefore, discuss the possibility of making the script size dynamic, in the sense that if the window is larger, more results will be shown under "Select variables" and "Select countries". We are only talking about dynamic scaling in the y-axis (height), so the script width should never change, only the length. All other portions of the script will remain the same size. If this work is feasible, discuss what the optimum maximum size should be.	Open
Task	Better manage subnational areas [ws][countries & provinces]	Areas that were sub-national areas and become a country (or vice versa) should be comparable to their counterpart (for example, Georgia should be comparable to USSR:Georgia). This is here not for them to do something exactly, but to ask if anyone has a better way of doing this? (FAOSTAT, data.fao, etc)	Open
Task	Show source for E data[db result page - Diss][ds]	Clicking on a value with an E qualifier shows the source: Corporate Author	Open
Bug	Internal MD codes visible in DS CSV flat download	When downloading CSV Flat in the DS, the visibility codes (P, F, W) and the stickiness codes (N, S) are visible. They should not be, they are not in the CSV Table download, only in the CSV Flat download.	New
Generated at Tue Nov 15 10:31:35 CET 2016 by Karen Frenken using JIRA 5.1.8#787-sha1:823790ce17da57e7ed0220e49723c7b00a6d54dc.			

4. Country update

Country survey files and folders on the **Divisional shared drive** are located under:
[...\AQUASTAT\Country survey](#)

Note 1: If possible, make arrangements to have a national expert do the work. In some cases it might be needed to recruit and pay a national consultant. It is hoped that through the recommendations given in the “AQUASTAT Looking forward” report prepared in September 2016, as well as through the SDG 6.4 reporting mechanism, a more structured and sustainable system can finally be set up, including national focal points

Note 2: In case there is no national expert the country profile should be done based on the old country profile, and new literature and data found on internet or in recent books. It is usually helpful looking for this data on government and ministries websites. While AQUASTAT has been forced to work like this from 2015 onwards, it is far from ideal and far from correct since access to the wealth of grey literature available in the country (literature that is not available on the Internet) is indispensable for this work and not possible without a national expert.

Note 3: See also section 4.6 on “Ideas for a new AQUASTAT country update strategy in case of limited resources”, prepared in June 2013.

Below is a general description of the steps that have to be taken in order to prepare a country profile in AQUASTAT and to update all data and information.

4.1. Updating a country

4.1.1. Information from the national expert

The national expert has to fill in the questionnaire and prepare a country profile (including tables and figures if possible), has to verify/update the water resources sheet, the dams excel file and the irrigated crop calendar. When receiving this information:

- ✓ Check whether the information sent by the national expert is correct, compare it with figures already existing in the Main Database to see whether it is consistent, also verifying possible time series.
- ✓ Check whether all the necessary/most important data and information is presented or whether something crucial is missing
- ✓ If any data is not clear or something is missing, send questions to the national expert. Normally there is a range of exchanges with the national expert. These new questions and answers will be saved in folders named: Version 1, Version 2 and so on.
- ✓ Prepare a definitive country profile, tables and figures with this new information
- ✓ Upload the new data in the Main Database

4.1.2. Questionnaire

Questionnaires and guidelines are available in English, French and Spanish and can be downloaded from <http://www.fao.org/nr/water/aquastat/sets/index.stm#main> or from the shared AGL Drive above.

National data: Check whether the data are reliable and compare them with data already existing in the AQUASTAT DB (big changes should be discussed). Make sure that where applicable the total is equal to the sum of the components (Example: variable 4311 = variable 4308+4309+4310).

Subnational data: Check if the addition of subnational data is equal to national data.

References: Check whether the references are written correctly. Make sure that there is only one reference per variable. In case there are more, ask the national expert to choose the reference which is most important.

Institutions: Check whether all needed information is there.

For uploading in the Main Database the Excel questionnaire is not used anymore for now. It has to be transformed to the format of the CSV-Maker (see section 3.1.2). In the future the option of questionnaire can become available through the SWS (see section 8.3).

4.1.3. Country profile

Prepare a definitive country profile with:

- The information given by the national expert.
- Check the old AQUASTAT country profile and figures in database. This data can still be useful and good time series may be established. However, if too contradictory, either the old data or the new data need to be removed, based on what is decided to be the more reliable data.
- Read all documents in the "+TBP" folder of the country in the "Sources" folder ([\\...\\AQUASTAT\\Sources](#)), to check any useful quantitative and/or qualitative information.
- Only when a source is used for data in the Main Database, move it to the "Used for data in DB" folder. If it is not used or if it is only used for text in the country profile, move it to the "Not used for data in DB" folder.
- If any important information is missing try to find it through the Internet.
- All country profiles should have the same format, sections, etc., as given in the guidelines. See for example the latest ones that have been updated (shown under "Latest updates" on top of this page http://www.fao.org/nr/water/aquastat/countries_regions/index.stm).

Data in the profile has to be consistent with data in the tables. As explained in the section 4.1.4 "Country tables" below, data in "Table 1- Basic Statistics and Population" are always taken from specific sources and not from sources given by the national expert. If needed, write to the national expert saying that his/her country has to get in touch with for example FAOSTAT, UNDP, UNFPA, World Bank, etc. if they want to change data. Once it has been changed on those official websites, AQUASTAT will change also.

At least once in the text reference has to be made to tables and figures in the profile.

COLOURS in the text (this is for the manager to have a quick visual overview of what changes/updates, etc. are being proposed by the international/regional consultant who, if resources available, is recruited to assist the manager in finalizing for example the country updates):

- Black text (no background colour): New information
- Background Blue: the text has been taken from the old profile
- Red text or yellow background: it has to be checked, is not correct, etc.
- A new colour can be added if the meaning is explained

Country profiles are prepared in English or French or Spanish, following the official language of the country. If the official language is Arabic or Portuguese, it is prepared in either English or French, depending on the second official language of the country; if the official language is Chinese or Russian, it is prepared in English.

4.1.4. Country tables

Prepare the tables with the information given by the national expert and scrutinized by AQUASTAT.

Remember that the following data are taken from specific sources, as explained below, and not the consultant sources:

Physical areas and Population: <http://www.fao.org/faostat/en/#data/RL> (areas) and <http://www.fao.org/faostat/en/#data/OA> (population).

Gross Domestic Product: <http://data.worldbank.org/data-catalog/world-development-indicators>

Human Development and Gender Inequality indices: <http://hdr.undp.org/en/data>

Access to improved drinking water sources: <http://www.wssinfo.org/data-estimates/tables/>.

There are 4 standard tables (Basic statistics and population; Renewable water resources; Water uses; Irrigation and drainage), but more tables can be added in between or after if needed, applying the same format. Be careful to also use the correct unit and correct conversion if needed (especially check use of km³ or million m³).

Standard table templates in English, French and Spanish are available in the folder: <\\...\\AQUASTAT\\Country survey\\01-Questionnaire\\Templates for country tables>

Every table has to be mentioned at least once in the country profile. The numbering of the tables has to be according to the order of appearance in the country profile.

4.1.5. Country figures

Prepare the standard figures (water withdrawal by sector, by source, source of irrigation water, irrigation techniques, scheme types, irrigated crops) and other figures, if interesting information available.

The figures must have the same format and colour scheme as in for example the Middle East country figures.

Pay attention in the figure “Irrigated crops” because permanent crops must have a different green than annual crops.

Every figure has to be mentioned at least once in the country profile. The numbering of the figures has to be according to the order of appearance in the country profile.

4.1.6. Water resources sheet

In case the national expert gives new information on water resources this must be updated in the water resources sheet and in the Main Database, IF accepted. A very careful check always has to be done with regards to external water resources, which include transboundary flows. If changing one country, possible changes in other countries in the same river basin have to be carefully analysed. PDF water resources sheets are automatically generated from the Main Database (<http://www.fao.org/nr/water/aquastat/work/wbsheets/index.html>). When pushing the “Publish to dissemination system button” (<http://www.fao.org/nr/water/aquastat/work/publish/status.html>, if administrator privileges), and then the “Publish data” and “Publish PDF” buttons, the latest information becomes available in the PDF water resources sheets (see section 1.1.11).

Note: Water resources **for now** are long-term average annual values, meaning that water resources data are the same in all years (from 1961 to 2016). Future changes, taking into climate change, should/could be considered (such as for example rolling annual averages, 1961-1990, 1971-2000, 1981-2010 or something else considered important, useful for the purpose of AQUASTAT and above all feasible). A test was been done by AQUASTAT with rolling averages of annual precipitation (1961-1990, 1971-2000, 1981-2010). This however did not show significant changes.

Check the document “Renewable Water Resources Assessment - 2015 AQUASTAT methodology review” (<http://www.fao.org/3/a-bc818e.pdf>) for a major review undertaken in 2015.

4.1.7. Dams

The national expert will, if possible, update the dams Excel file provided to him/her with all the major dams in the country. In the profile and on the detailed country map the most important dams should be named and shown, and in the profile also total capacity of dams in the country should be mentioned. To check whether Variable [4197] in the questionnaire (Total dam capacity) somehow matches with total dam capacity in the dams Excel file. Sometimes it doesn’t match exactly because not all dams are included in the dams Excel file. It is important to have information on the capacity as well as on the surface area and the height, to be able to do a checking whether the data make sense (sometimes the combination of the data for height, area and capacity given is simply not possible, so one of the data must be wrong) and to be able to calculate evaporation from artificial lakes and reservoirs.

After checking the dams Excel file, the information will be used by the GIS expert to locate the dams on the detailed country maps, if coordinates are available, and have other information.

Section 5.1 explains how to transfer the dams to .xlsx and .kml by country to be used on the webpage and in the Main Database.

4.1.8. Irrigated crop calendar

The national expert will, if possible, provide an irrigated crop calendar. To check whether it is consistent with Variables 4345-4379 in the questionnaire and also to check whether the cropping intensity is well calculated. See section 5.3 for more information on irrigated crop calendars.

4.1.9. Detailed country map

A GIS expert prepares detailed country maps, based on detailed information to be provided to him/her. For more information see section 4.4 and the folder [\\...\AQUASTAT\Country survey\02-GIS work for country maps](#).

Attention should be paid that the spelling of towns, rivers, etc., on the map is the same as in the country profile. If there are differences it has to be decided which spelling has to change.

4.1.10. Decisions and checks

In order to be aware also at a later stage what changes have been made, what issues are controversial, or any issue that has to be checked, the document: "Region year update - decisions and checks 2011xxxx.doc" is prepared. This file is available by region in the "0-update" folder. See for example for Africa here: [\\...\AQUASTAT\Country survey\Africa\Survey2013-2016\0-update](#). Everything possible should be written here, since all that has been done should be understood later when questions will come, successors will work, etc. As much as possible should be written in this file. The importance of this file cannot be underestimated, especially since several people are working on AQUASTAT and it is a means of communication between the different people.

4.1.11. Comparison table

This table is very important in order to prepare the Regional Analysis. All new data must be in the table next to the previous data (i.e. the latest data in the Main Database before updating), to get an overview of what has changed. Example: "South-America_comparison new+web 20140925.xls" in the folder [\\...\AQUASTAT\Country survey\America Southern and Central and Caribbean\Survey2015\Southern\0-Update](#).

4.1.12. Sources

Every file in the folder [\\...\AQUASTAT\Sources](#) should be named as follows: "XXXYEAR_ShortDescription.pdf", for example BAH2005_AgriculturalAreas.pdf, where XXX is the ISO3 country code. Try to keep the description very short and clear.

In case only a hard copy is available and not a digital copy, scan the first page, the last page and the table of contents. If there is a specific water-related section that can also be scanned if not too many pages. The national expert should send all the references.

4.1.13. Update the Global Map of Irrigation Areas (GMIA)

New figures of total irrigation area and irrigation areas by provinces in the country have to be updated in a document. It has to be compared with what is done by AQUASTAT and the University of

Bonn. Latest information is available here <http://.../AQUASTAT/GMIA/Version 5.0 Website update 2013>. The downloadable zip file contains also sub-national information. However, be sure that first of all an effort is made to find information FROM the country and then after that it can be compared with this information. See also section 5.2.

4.1.14. Update water withdrawal

New figures on water withdrawal, by sector and by source, have to be updated in a document. As an example, see the file prepared done for the Middle East in <http://.../AQUASTAT/Country survey/Asia Western - Middle East/Survey 2008/0-Update/update water withdrawal>, but first all this can be written in the “Decisions and to be checked” file (see section 4.1.10).

4.1.15. HTML

When the country profile, tables and figures are finished, the country profile has to be updated in HTML <http://faoint0b\mr\water\aquastat/>.

4.2. Updating an online country profile

Country Profile #include logic in the AQUASTAT website

Version: 2015/05/27

This explains the include logic that's used in the country profiles in AQUASTAT websites. There are 2 requirements:

- Country profiles where all the information for a country is put together.
- Segments where topical information for any country can be quickly found.

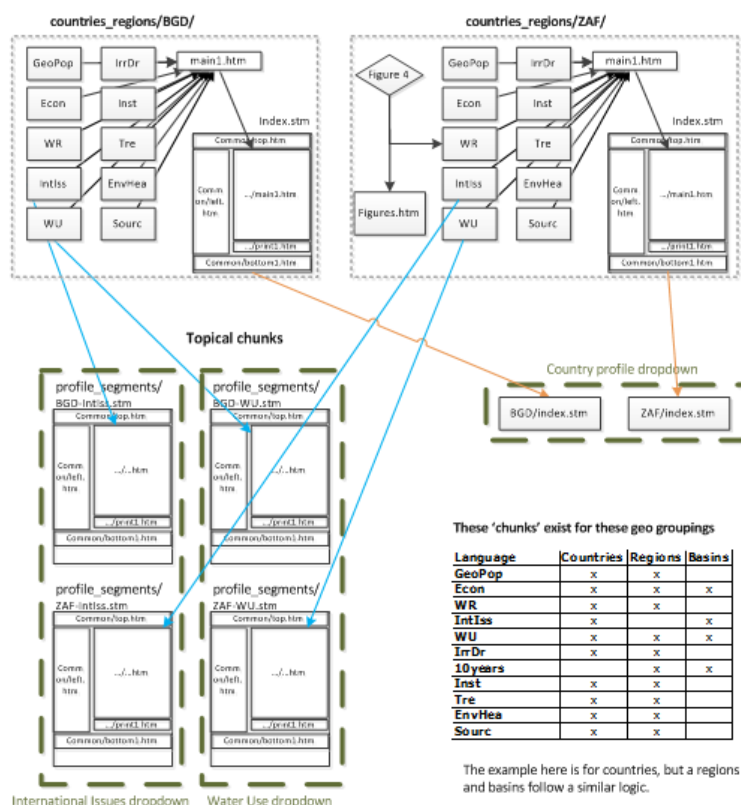
This means that we need two end files. This is the way that we do it:

- Within each country folder in countries_regions/, there are chunks that are specific to each country-topic. So for example, there are 10 “topic” files for BGD (not really 10... one of them is the source).

- INCLUDE all these files into main1.htm
- INCLUDE main1.htm into index.stm, with the top, left, print, and bottom (all in common) for the appropriate language.

By doing this, we can aggregate profiles in a dropdown by country... or in multiple dropdowns by topic.

NOTE: Figure 4 is only presented as an example... all figures and tables need to be included in the figures/tables.htm AND the profile segment. Also, when they are included, you have to step down out of the folder and then back in (because profile_segments won't see the figures otherwise).



When a country profile is edited, files like AFG-WR.htm (for Afghanistan) or so will be modified. Whenever the changes are finished, the following steps need to be undertaken:

- Create a new file in countries_regions/profile_segments/, that matches. In the case above, create 3 new files, which all include the same htm file (unless the profile is in multiple languages of course):

- a. AFG-WR_eng.stm
 - b. AFG-WR_esp.stm
 - c. AFG-WR_fra.stm
2. If it's not already there, add the Afghanistan profile to the Double dropdowns (3 languages x 2 files [one for the 'per-country-menu', the other one to associate the country to the ISO]).
3. Add the new files to the appropriate profile-topic dropdown. In the case above, make sure that the new segment is added to the topical dropdowns:
 - a. dd_prof_WR_eng.htm
 - b. dd_prof_WR_esp.htm
 - c. dd_prof_WR_fra.htm
4. Make sure that cp_header.htm has all the latest information... for example:
 - a. Is the dams file correct and referenced? If there are no coordinates, then provide the Excel, and make sure to use the right icon.
 - b. Do new figures and/or tables need to be included in figures/tables.htm for that country?
 - c. New map?
5. If the section is one that has data, then add a parametrized query for that country. It's probably simplest to just go to another country that has that section (so for our example above, go to let's say to BGD-WR and copy that parametrized search and replace the country_id... this is simplest since there are many parameters that need to be set). So assuming it is just copied from another country, then the parameter "cntIds" needs to be modified to whatever the new country is (it's the country number that's in the database). So assuming it is copied from BGD-WR to become AFG-WR, then cntIds=16 needs to be changed to cntIds=2.

4.3. Storage of references/sources

AQUASTAT sources related files and folders on the **Divisional shared drive** are located under:

<\\...\AQUASTAT\Sources>

AQUASTAT sources references in the main database can be found in the Working System under:

<http://www.fao.org/nr/water/aquastat/work/sources/search.html>

AQUASTAT sources dynamically added to the CIO sources folder when created are available here:

\\hqlprtmc04.hq.un.fao.org\TC70AquastatWork_appdata_user\Sources

Sources in AQUASTAT are used as follows:

1. In the Main Database (to substantiate data)
2. In the glossary
3. In the country profile

These sources are sometimes kept in a formal database (1), but sometimes are just text (2, 3).

There are various states that these sources can be in:

- A. Used
- B. Not used because there was no usable info
- C. Not used because the information was internally incorrect
- D. Not used because the info didn't match ours

In some cases the source file itself is stored, in various folders:

- a. CIO/Sources (dynamically connected to the sources database)
- b. AQUASTAT/+TBP
- c. AQUASTAT/Not used for data in DB
- d. AQUASTAT/Used for data in DB

Ad a: CIO/Sources

When uploading data with a source, then if it is a new source that does not yet exist in the database it has to be added to the sources database:

<http://www.fao.org/nr/water/aquastat/work/sources/search.html>. This source will then automatically be added to the CIO/Sources folder
\\hqlprtomc04.hq.un.fao.org\TC70AquastatWork_appdata_user\Sources.

Ad b, c, d: AQUASTAT +TBP/Not used/Used

Sources on the shared drive are stored in the country folder concerned in the following folders:

- b. +TBP: This refers to documents that haven't been analyzed yet for data and information. Whenever one comes across a document that may be of interest for AQUASTAT it is added to this folder until processed.
- c. Not used for data in DB: This refers to documents that might or might not have interesting information for the country profile, but they don't have data actually put in the database, so they will not be included in the CIO/Sources folder (a).
- d. Used for data in DB: This refers to documents that have data actually put in the database, so they will also be included in the CIO/Sources folder (a).

Sources are also given a standard name as follows: "ISOYEAR_ShortDescription.ext".

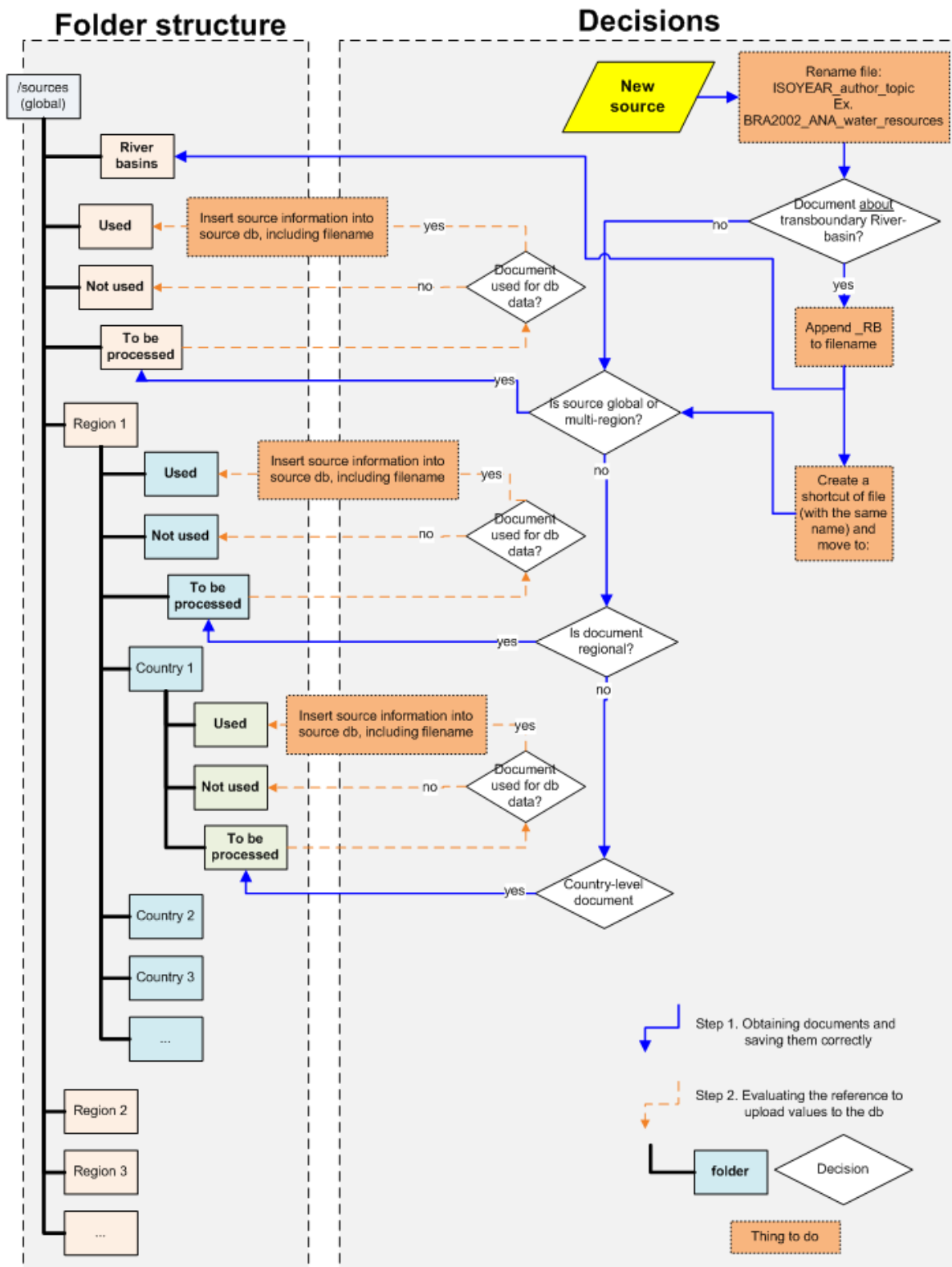
For example: "BRA2002_ANA_water_resourcves.pdf" refers to a report in PDF on water resources prepared by ANA of Brazil in 2002.

Sources dealing with river basins have the basin name instead of the country ISO3 code. Countries dealing with a region or the world have the short name of the region or World instead of the country ISO3 code.

The next page shows the flowchart of the sources treatment.

AQUASTAT – NEW SOURCE DOCUMENT TREATMENT

REV.3 – 2014/10/07



4.4. Preparation of detailed country maps

AQUASTAT GIS work, including guidelines, for the preparation of detailed country maps is on the **Divisional shared drive** located under:

<\\...\AQUASTAT\Country survey\02-GIS work for country maps>

AQUASTAT country maps on the **Website drive** are located in the folders of the country (ISO3 code name):

<\\faoint0b\nr\water\aquastat\countries-regions>

Information for the maps should be put in the 0-Country Maps folder of the region, see for example <\\...\AQUASTAT\Country survey\Oceania and Pacific\Survey 2016\0-Country Maps> for Oceania and Pacific. Any additional map (with rivers, schemes, regions, etc.), dams Excel file, or additional file that could be useful to prepare the country map, should be put in this folder as well.

For style, see also the file “Guidelines_AQ_CountryMaps_2015.pdf”, prepared by the GIS expert, in the 02-GIS work folder on the Divisional shared drive given at the beginning of this section.

4.4.1. Information collected for the GIS expert to be able to prepare the map

In ***bold/italic*** below is the information to be collected for the GIS expert and how it is presented in the file to be prepared for the GIS expert. The information is taken from the country profile, tables (some information on rivers or irrigation schemes may be in the Tables and in the dams Excel file). In general, all important information in the profile should be shown on the map. Once prepared, the file is saved as “XXX_Info for country map_yyyymmdd.docx” (where XXX is the ISO3 code of the country concerned) and sent to the GIS expert.

Information for the country map of [NAME OF COUNTRY] [day/month/year]

To put the following information on the map (font of labels, river lines, dams symbols, etc., and legend should be similar to the other country maps):

1. ***Bordering countries:*** Give the name of all the bordering countries. Once the map is done, check whether all the countries in the map have a label.
2. ***Oceans/Seas:*** Give the name of Oceans and Seas to be included in the map.
3. ***Administrative divisions:*** Depending on the country there are different first level administrative divisions: regions, provinces, departments, states, parishes, etc.; and even different levels of administrative divisions. Usually the information is taken from the CIA world fact book (<https://www.cia.gov/library/publications/the-world-factbook/>). For example for Argentina see section “Government/Administrative divisions” on this page <https://www.cia.gov/library/publications/the-world-factbook/geos/ar.html>.

A label for each region is put on the map. For some countries, such as Mexico or Dominican Republic, that have more than 30 regions, it was not good to have the labels on the map (too many labels), so it was decided to put the names as a list in a corner of the map. But, if possible, try to locate them on the map.

For some countries, the administrative divisions used by the GIS expert – coming from GAUL – are not up-to-date and names may have changed, or there could be additional divisions or

divisions that don't exist anymore. When receiving the first draft of the map, check whether the name of any region/province should be added, removed, or changed. In these cases, a map is searched for on the internet with new administrative divisions or a map may have been sent by the national expert, and given to the GIS expert, so s/he can design the new border lines.

4. **Capital city:** Give the name of the capital city.
5. **Regional capital:** Usually the names of all regional capitals are put. This information is easy to find. If there are too many (i.e. too many labels), the most important ones (by population generally) are chosen.
6. **Other towns:** In addition to the capital city and regional capitals, the name of any other town that is mentioned in the profile is given (except if the town is too small). For most maps "other towns" are not put.
7. **Rivers:** To put all the rivers mentioned in the profile and tables. Some profiles don't mention the most important rivers (or mention only a few rivers). In these cases to do a quick search on the Internet to find the most important rivers of the country. On average, usually around 20 rivers per map are put, though some maps could have 10 rivers, and other maps could have more than 30. It depends on the information that is available, the information of rivers in the GIS layers, and how they are located on the map (sometimes it's also not attractive to put too many rivers).

If a river is shared between two countries and changes name when crossing to another country, if possible put the name of the other country between brackets (Example: Massacre/Dajabon river in Haiti and Dominican Republic. Massacre is the name used in Haiti, so in the map of Haiti we put "Massacre (Dajabon)", and in the map of Dominican Republic we put "Dajabon (Massacre)". If it's just a matter of one or two letters, for example Artibonite (in Dominican Republic), Artibonite (in Haiti), is not necessary to put both names.

8. **Lakes:** Put the name of any important lake mentioned in the profile.
9. **Dams:** Give the name of the most important dams, mentioned in the profile (or important in the dams Excel file). For example, depending on the country the name of dams larger than 3 000 million m³, or 1 000 million m³, or 500 million m³, etc. is given. On average around 4-5 dams per map are put, but some countries have more than 10 dams and some countries don't have any dam at all. We used to give the dams template to the GIS expert, so s/he could check the information on dams there. Now we usually extract the useful information from the dams Excel file (location, river, coordinates, etc.) and put it directly in the "Info for country map.doc" file, so the GIS expert doesn't spend time searching for this information in the dams Excel file. For some countries, if the information is easy to find, we still give the dams Excel file.
10. **Use GMIA to locate the zones of irrigation development:** These are the green areas on the maps. The GIS expert takes these irrigation areas from the GMIA-4 (or GMIA-5 if available) layers. The irrigation zone does not mean that the whole area is irrigated; it is just an indication that in that region there is some irrigation. So, while the real irrigation area may be 1% of the country, with these zones we can go up to 5-7-10% of the country. This means for example that if AEI is 1% of the total area of the country, the green irrigation areas in the map could represent 5-7-10% of the country.

Thresholds: The GIS expert should give three examples of irrigation zones taken from the GMIA-4 (or GMIA-5 if available), with 3 thresholds: >0.1%, >1% and >2% (this means that it includes areas where percentage of irrigation is >0.1%, >1% and >2%) and after that a decision is taken which one to use for the map. Usually >1% or >2% is taken (for American countries), but it has to be studied depending on the country, what were the hectares in GMIA 4 and GMIA 5 and what's the

irrigation area in the country profile. In case one thinks that none of the proposed 3 thresholds: >0.1%, >1% and >2% are valid, another threshold can be asked. For example for Cuba 6% was taken. An example of the thresholds that the GIS expert would give is available in the folder: "Examples thresholds irrigation".

11. **Irrigation schemes:** Give the name of the irrigation schemes mentioned in the profile that are indicated on the maps as a green triangle. The location of these schemes is, in many cases, difficult to find. GIS experts generally ask for help to locate them. For this reason, try to find the location of the irrigation schemes before sending the Word file to the GIS expert (or while the expert is preparing the country map). In case it's difficult to find, either it is not put in the list of schemes, or the GIS expert is asked to try to find it, but not to spend too much time on it if s/he doesn't find it.
12. **Mountain peaks/mountains ranges and/or wetlands/marshes and/or oases:** Give the name of any other important feature mentioned on the profile.

4.4.2. Assisting the GIS expert during the preparation of the country map

Depending on the map, the GIS expert may ask for some help while s/he prepares the map. S/He usually shows several drafts of the country map while preparing it. Each draft has to be checked to see if there is anything wrong. To discuss or decide with him/her:

13. Thresholds of GMIA (see the GMIA bullet point in section 4.4.1): before any draft, s/he will give the 3 options for thresholds, and it has to be decided which one to choose.
14. Layout of the map: Some country maps are portrait (for example: http://www.fao.org/nr/water/aquastat/countries_regions/ARG/ARG-map_detailed.pdf), some countries are landscape (for example: http://www.fao.org/nr/water/aquastat/countries_regions/MEX/MEX-map_detailed.pdf) and with the legend on the top or in the left. This depends on the shape of the country. Usually, the GIS experts are good to choose the layout, but in some occasions you may ask to modify a little bit the layouts, or they may ask how to put it. Pay attention also to the little location map on the corner, to see whether it's correct or not.
15. Font style and font size for labels of rivers, dams, cities, etc.: the size should be as in the country maps of America (for example: http://www.fao.org/nr/water/aquastat/countries_regions/SLV/SLV-map_detailed.pdf). See also the guidelines prepared by the GIS expert. Labels for rivers and dams shouldn't be reduced because it can bring problems when putting the map on a water report.
16. River lines and dams symbols: the thickness and size should be similar as those in the country maps of America. The river line should be on top of the country boundary line, if it is the border between countries.
17. Too much information on the map: if there are a lot of regions, towns, rivers, schemes, dams, it may happen that the map is not attractive any more. Ask to remove the less important items.
18. Rivers: the GIS expert may have problems to locate some rivers using his/her GIS layers. In these cases try to find them on the internet (sometimes they appear in google maps, or other documents). But if it's too difficult to locate them, and the river is not very important, don't spend too much time on it.
19. Dams: if the GIS expert has problems with any important dam, try to find it. If it's too difficult to find, it may be decided not to put it.

20. Irrigation schemes: see the Irrigation schemes bullet point in section 4.4.1.

4.4.3. What to check when the map is done

21. To check that all rivers, regions, dams, schemes etc. are included in the map, with the correct name that was provided. The names should be the same in the map and in the profile.
22. Rivers: The GIS expert may add a river that was not on the list. This is usually accepted, if there is enough space. The river lines outside the country should be in a lighter blue. See for example for Bolivia: http://www.fao.org/nr/water/aquastat/countries_regions/BOL/BOL-map_detailed.pdf. The rivers that are on the border line between two countries should be visible enough. If the river line is below the country or administrative boundary, ask to put it on top of the administrative or country boundary.
23. There could be inconsistencies between the name of a city, a region and a river. Try to put the same name for all of them, deciding which name is more correct (For example, in Dominican Republic we had Pedernalis for river and Pedernales for province and region, so we decided to put Pedernales also for the river). If necessary do corrections in the profile.
24. Legend: to check that all the symbols in the map are included in the legend.
25. The legend will be put in both English and Spanish for the Spanish speaking American countries and in English and French for all African countries (so also English for the French ones and French for the English ones, since in Africa there are often entire publications in French or entire publications in English).
26. Scale: to check that the scale is correct (approximately).
27. Font style and font size for labels of rivers, dams, cities, etc.: explained in section 4.4.2 and in the note prepared by the GIS Expert in the folder indicated at the beginning of this chapter 4.
28. River lines and dams symbols: explained in section 4.4.2 and in the note prepared by the GIS Expert in the folder indicated at the beginning of this chapter 5.
29. Comparison with country maps of bordering countries: if the country maps of bordering countries are ready, to check that there are no inconsistencies in rivers, dams, etc., appearing in both maps.

4.4.4. Resolution of the map

Once the map is prepared, the GIS expert should send the same map with 2 different resolutions: 150 dpi and 300 dpi. The map with resolution 300 dpi is usually the one put on the website.

4.4.5. Where to put the maps in the Divisional shared drive and the Website drive

When all the maps of a region (or sub-region) are finished, and it is sure that there will not be any more modifications, then move the final maps to the "...\\0-Country Maps\\Maps Countries Detailed Final" folder of the region concerned on the Divisional shared drive.

Once the profile is done in html, put the map also in the country folder concerned of [\\faoint0b\water\aquastat\countries_regions](http://faoint0b\water\aquastat\countries_regions). Be sure that the name on the website drive is always the same, even if replaced by an updated map: XXX-map_detailed.pdf, where XXX is the ISO3 code of the country (put the 300 dpi map).

4.5. AQUASTAT and Eurostat and OECD countries

Country profiles have been prepared for 147 countries: in Africa (2005-2016), Asia (2008-2012), Southern and Central America and the Caribbean (2015-2016), and Eastern Europe (2015-2016). They have not been prepared for countries in Northern America (except Mexico in 2013), Oceania (except Fiji, Samoa, Solomon Islands, Vanuatu in 2016), and Western and Central Europe. AQUASTAT does not actively look for data in Eurostat and OECD countries, but takes data of key variables and indicators for these countries from the Eurostat and OECD databases.

4.6. Ideas for country update strategy in case of limited resources

Warning - Introductory Remarks

The ideas below were prepared several years ago (around 2013) in order to be able to get the maximum amount of data and information with minimum resources available. It is not an ideal situation and it is preferable to start concentrating on making AQUASTAT for example a Corporate Technical Activity (CTA), so as to have at least a minimum amount of money guaranteed on a yearly basis. For this, it is recommended to prepare a document to be submitted to the COAG. Also, other recommendations in the document prepared by a consultant in September 2016 "AQUASTAT: Looking forward" and the results of the user survey held in July-August 2016, should be used to reflect further about a sustainable future for AQUASTAT.

In order to remain credible, many more resources are needed. It is against AQUASTAT's policy to have a country update done by a part-time international consultant through Internet search and literature review, as is the case for the last few years due to lack of resources. In that case, it becomes better to not doing an update at all rather than not having country involvement. For this, again it is important to give AQUASTAT a more official mandate, like FAOSTAT, in order to be able to make official requests to countries for data. In fact, it would be even preferable to have AQUASTAT data requests included in FAOSTAT data requests.

Additional resources may become available through the SDG 6.4 monitoring process for which FAO is the custodian agency. Within that SDG framework, there is also a possibility that official national focal points can be nominated. Data for key variables in AQUASTAT (such as water resources, water withdrawal, irrigation areas) will need to be collected also for the SDG 6.4 monitoring.

In the meantime the ideas below maybe help to deal with resource constraints. Some ideas may already be obsolete and there are some not fully completed sections, but the document may still be useful for someone who has to become familiarized with AQUASTAT.

The file, including annexes, on country update strategy is on **Divisional shared drive** located under:
[\\...\\AQUASTAT\\Country survey\\01-Questionnaire\\Country Update Strategy](#)

4.6.1. Introduction

The AQUASTAT Main Database reports water statistics at country level with a special emphasis on irrigation and agricultural water. Continuous data collection processes populate and update the database, while careful and meticulous data analyses ensure its reliable data quality and accuracy. Despite constant efforts to update the database and the country profiles, the current updating strategy requires too much time under the current staffing conditions due to resources constraints to maintain the current data quality. As a result, the most common criticism reported on AQUASTAT relates to the fact that for a specific country the latest data can be relatively old.

This section 4.6 seeks to assess the current updating strategy, also described on the website at http://www.fao.org/nr/water/aquastat/countries_regions/index.stm#process and <http://www.fao.org/nr/water/aquastat/sets/index.stm#main>, but more importantly to investigate alternative ways to access data and identify new updating strategy options that would: 1) be less time consuming, 2) be less expensive, but 3) permit access to recent data.

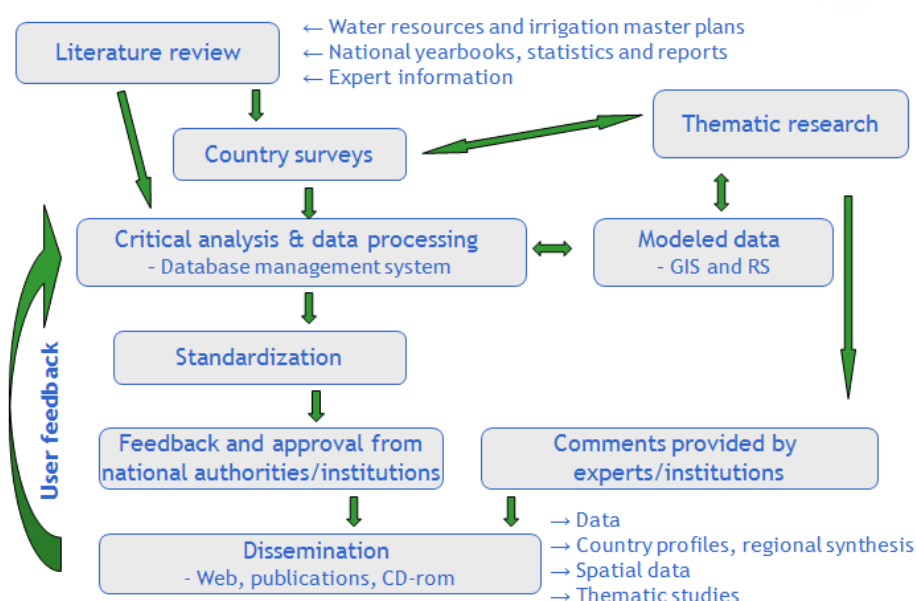
4.6.2. Current country update strategy

The information provided by AQUASTAT relies to a great extent on national capacities and expertise. The information management process (Figure 1) comprises:

- A review of literature and information at country and sub-country level
- Country surveys, through national resource persons, consisting of data collection and country description by means of a detailed questionnaire where the source reference and metadata are associated with each value
- Critical analysis of information and data processing, with preference given to national sources and expert knowledge. The data validation and processing is supported by the AQUASTAT database management system
- Modelling of data by means of Geographic Information System (GIS) and water balance models for estimating unavailable data and for providing spatial data. GIS and remote sensing data are important input together with data acquired through country surveys, which are also used for model calibration (see next section)
- Standardization of information and data tables
- Responding to requests for feedback and approval from national authorities and institutions
- Dissemination of information through the AQUASTAT website, published reports, CD-ROMs
- Voluntary feedback from users and through cooperation with other institutions

FIGURE 1

The AQUASTAT information management process



In addition, a continuous checking of national statistics available online is also performed, although not as systematically as desired due to staffing constraints.

TABLE 1

Strengths and weaknesses of the current country update strategy

Step	Strengths	Weaknesses
Literature review and internet search	Rely only on AQUASTAT team: reduced timeframe, coherency of variables definition	<ul style="list-style-type: none"> No access to grey literature Few countries have the exact data AQUASTAT is looking for (geographical unit, different definition, etc.) available online
Country surveys with a national consultant	National expertise both from national consultant and grey literature	<ul style="list-style-type: none"> Cost (>US\$3 000 per country) Identification of appropriate national consultant Long process (see section 4.6.3: Timeline) Time consuming for AQUASTAT team (through exchanges with national consultant for clarification/coherency) Discrepancies on variables definition despite AQUASTAT guide Results (data obtained) not always good (few data, old data)

4.6.3. Checking time, cost and data quality of the current country update strategy

Methodology checked in Burkina Faso, Mali and Niger for the 2013 AQUASTAT Survey

The current country update strategy (section 4.6.2) was used, but simultaneously:

- The timetable was carefully recorded to check the time needed for a full country update cycle
- An online search was done at each stage of the exchange with the national consultant below, in order to check how much could have been found without a national consultant, so in practice whether the references used in the questionnaire by the national consultant could have been found online or at least identified (even if no access to full paper):
 - Before receiving the 1st draft from the national consultant
 - When receiving the various versions from the national consultant by trying to find the cited references
 - After the final version was submitted to make sure no additional information could be made available through the consultant

Timeline

The recorded timetable proved that the country update cycle is indeed time-consuming for the national consultant, but also for AQUASTAT with at least 2 days of work for each version submitted.

TABLE 2

Timetable of the 2013 AQUASTAT country update for 3 African countries

Country	Identification & 1 st contact	Contract	First draft	Final version	Finalization	Submission to government (expect. +real)	Online (expected date)
Niger	11/2012	11/2012–02/2013	01/2013	03/2013	06/2013	06/2013 08/2013	10/2013
Burkina Faso	10/2012	Idem + 1 month	01/2013	04/2013	06/2013	06/2013 08/2013	10/2013
Mali	11/2012	Idem + 2 months	01/2013	Ongoing	07/2013	07/2013 08/2013	11/2013

Note: Blue background indicates work to be performed by AQUASTAT. AQUASTAT also spends a lot of time revising different versions between the first draft and the final version

So, at the very best, the country update process lasts one year before new data can actually be published online, with at least 3 months (government revision) that cannot be shortened due to official requirements. Hence, only the 'national consultant' phase can be reduced.

Test results

- For all 3 countries, very recent data (2010 to 2012) were only obtained from 'grey literature' (internal reports from Direction of Hydraulics or equivalent and from agricultural statistics) and/or not available online: *the national expertise is indispensable*.
- Online were found only additional data but not the 'core data' (such as irrigation areas and irrigated crops areas); however still very useful to check data quality and comprehensiveness of the consultant versions.
- Despite the national consultant contract, still a very long (time-consuming) work by AQUASTAT was needed to obtain coherency and clarity and as much data as possible after each version submitted by the national consultant; very much time needed to be spent on exchanges with the national consultants, also to make the definitions and terminology understand.
- Despite efforts put by AQUASTAT, a long process and the cost of a national consultant, there were some cases where almost no new data were obtained through the current country update strategy.

4.6.4. Access to data with regards to water and irrigation

Ways to access data (non-exhaustive list)

Generally, the two most knowledgeable institutions regarding irrigation are usually part of the Ministry of Agriculture. Most of AQUASTAT data originates from them:

- Direction of Hydraulics or Water Resources
- Agricultural or National Statistics (through Census for example)

However, there are also other ways to access data on water:

- State of the environment when published regularly
- Water distribution entities (although mostly on drinking water)
- Programmes monitoring food security
- Treasury (through water fee if any)
- International organizations, regional organizations (NEPAD, AMCOW, etc.) and NGOs
- Portfolio of irrigation/agricultural water management projects (either ongoing, in the pipeline or planned) and monitoring of these projects (although mostly at sub-national level)
- FAO's FPMIS documents

Other available data but discarded:

- Spatial information/GIS: only at a specific time in a year, not available or accurate for all countries

Difficulties to access data

Even when the data exists, there are some problems to assess their quality due to:

- Partial data
 - Divided by thematic institutional division (agriculture, industry, etc.)
 - Divided by geographical division (region, etc.)
- Data reported in others unit than required in AQUASTAT (in number of farms, or in production [t/ha] instead of areas)
- Conflicting data when different sources offer data on same variables

Other existing problems to access data:

- National water entities ask to fill multiple questionnaires on water by other international organizations

4.6.5. Updating strategy options: some, incomplete, ideas

Online search only

Although very practical as relying only on AQUASTAT, this option is discarded after the test (section 4.6.3) proved that the national expertise, at least through grey literature, is necessary to access recent and reliable data. See Annex A of the entire document, available in the folder mentioned at the beginning of this section 4.6.

Online search + International/regional organizations

- (i) Either through common questionnaire
- (ii) Or by contacting delegations in specific countries.

Potential interesting 'international organizations' to contact in the country:

- Country offices of IFAD, World Bank, European Commission, IWMI, etc.
- Departments of development aid: DFID, AusAID, USAID, AFD, SIDA, JICA, etc.
- Regional organizations: NEPAD, AMCOW (for example in Africa), etc.
- International, regional and national NGOs

Option (i) would certainly be the most recommendable under the UN-Water objective of collaboration between agencies; however at this point, this would probably not reduce the timeframe required for a country update.

Option (ii) would be time-consuming for AQUASTAT, both to contact each organization and to check the numerous reports produced by these organizations, if they actually answer and accept to share them.

Both options would not allow access to grey literature in most cases, or only second-hand at best, which could imply distortions due to interpretation of the variables definition.

Grey literature to be provided by a national (senior) water officer

- (i) Identify very carefully a national (senior) water officer from the Direction of Hydraulics/Ministry of Agriculture or equivalent.

- (ii) Contact the officer to kindly request copies of all documents (preferably recent documents) related to irrigation and (agricultural) water management, instead of asking to fill in a questionnaire to save him or her some time.
- (iii) Perform online search for additional documents, in particular from other national departments (industries, environment, etc.).
- (iv) AQUASTAT to prepare all: fill in the questionnaire/country profile/tables/irrigated cropping calendar/dams list/water resources sheet
- (v) Optional (to be discussed): Revision by the (senior) water officer before official submission to government; in addition, a final discussion between the officer and AQUASTAT could take various forms (Email/Phone/Skype) to reduce his/her workload (and thus the timeframe).

Practical questions:

- (i) What incentive for the officer to reply and to send the documents? Do we need to pay him/her? If so, how much? Can s/he accept for his/her department? Or just send FAO publications as a 'reward'?
- (ii) Should it be a senior officer? Or rather a lower to make sure s/he has time? But will s/he have access to the required information?
- (iii) Send a CD-ROM/USB drive to be returned with copies of documents? To be posted to FAO? Or delivered to FAO representation in the country?

Note added later: *The above three points should not be a problem once AQUASTAT is officialised through the COAG for example or through the SDG 6.4 monitoring process, but at this moment it isn't and AQUASTAT does not have the mandate to ask for national focal points).*

The option explained in this section would allow access to grey literature AND reduce the timeframe as the national senior water officer's workload is reduced compared to the national consultant in the current country update strategy: s/he is only asked to provide recent literature on irrigation and water management and not to complete the AQUASTAT questionnaire and write the country profile, etc. In addition, this option would also reduce the cost even in case payment has to be made to the officer.

More detailed guidelines for the national water officer on the collection of documents is provided in Annex B (English version) and Annex C (French version) of the file located in the folder mentioned at the beginning of this section 4.6.

4.6.6. Selection of countries where to test the new country update strategy

The new country update strategy could be tested in some African countries, representing a range of increasing difficulty to access data on irrigation and agricultural water.

TABLE 3

Potential countries to test the new country update strategy (to be discussed)

Country situation	French FAO language	English FAO language
Irrigation is well monitored	Morocco, Tunisia, Senegal	Nigeria, Zimbabwe
Irrigation is not specifically monitored	Chad	Mozambique
No data was found during the 2005 update	Côte d'Ivoire, Guinea-Bissau	Eritrea, DR Congo

Practical questions:

- Is it best to test it only in Africa? If so, in both English and French speaking country?
- Is it best to test it in different sub-regions of Africa or rather grouped?
- Is it better to test it in countries where irrigation is large or small? Small means more complicated as might not be well monitored, but large means that a significant part of African irrigation might be 'distorted' (not comparable).

4.6.7. Other issues

- Would it be beneficial to nominate an 'AQUASTAT Representative' in each country in charge of sending interesting report/information on irrigation when they become available? Do we want that? Can we do that? What incentive for the representative to send info? As long as AQUASTAT is not officialised through for example COAG or through the SDG 6.4 monitoring process, it cannot officially have national focal points.
- What to do when there is an exceptional situation in a country where update is planned (such as war in the country or part of the country)?
- Would the online checking of national statistics benefit from a database of interesting websites by country/region? In particular, would that help to be more systematic?

5. Topical updates

5.1. Dams

AQUASTAT dams related files and folders on the **Divisional shared drive** are located under:

<\\...\AQUASTAT\Dams global\--GLOBAL DATABASE>

AQUASTAT dams related files on the **Website drive** are located under:

<\\faoint0b\nr\water\aquastat\dams>

AQUASTAT external web page on dams is under:

<http://www.fao.org/nr/water/aquastat/dams/index.stm>

5.1.1. The dams global Excel file

Explanation of the columns in the “Dams” sheet of “Global dam reservoir db.v1.xx.xlsm”

In the “Legend” sheet of the file the meaning of columns in the “Dams” sheet are explained. Some additional information regarding this sheet is presented here:

Column A - ID: Any time a new dam is added, an ID has to be given, which is the number following the last ID in the file.

Column B - Country: Make sure that exactly the same name is used as in the AQUASTAT database. For example, it should be *United Republic of Tanzania* and not *Tanzania*, or it should be *Bolivia (Plurinational State of)* and not *Bolivia*, or it should be *Cabo Verde* and not *Cape Verde*, etc.

Column D - Alternate dam name: provide alternate name if available. It might happen that neighbouring countries give different names to the same dam or river, or it might be happen that a local name given is different from the official name.

Column F - Region: This refers to the AQUASTAT region in which the country is located. Attention should be paid that exactly the same name is put as can be found when clicking on the arrow in cell F3. For example: it should be C. Asia and not Central Asia.

Column G - Administrative unit: The name of the sub-national administrative unit in which the dam is located is often determined by using the GAUL dataset. Sometimes, such as for Brazil, the administrative unit was not available and instead the hydrographic region has been put and a popup comment added in the cell (which opens by clicking on the red arrow).

Column L - Completed /operational since: Year in which the dam was completed, operational or improved. If the year is not available, it is known that it is completed, the year 1960 is put in red colour. If the dam is not completed, then put: “Incomplete”.

Column N - Reservoir capacity (million m³): This refers to the initial capacity, not taking into consideration the reduction in volume due to sedimentation (see Column T). Make sure that the value is in million m³. It regularly happens that mistakes are made by not converting correctly from for example km³ (which is 10³ million m³) or from just m³ (which is 10⁻⁶ million m³).

Column O - Dams category: Leave empty. It was used for a specific other exercise.

Column P - Reservoir area (km²): Make sure that the value is in km²: 1 km² = 100 ha.

Column Q - Yearly ET0 (mm/m); Column R - Evaporation; Column S - Evaporation/Capacity: Do not fill in. These were used for a one time exercise to estimate the evaporation from artificial lakes and reservoirs. See <http://www.fao.org/3/a-bc814e.pdf>.

Column T - Sedimentation (latest known) (%): The capacity given in Column N refers to initial capacity. Often over time the capacity reduces due to sedimentation. If this information is available, then give it. Ideally also a year should be given with it, for example by putting it as a popup comment, since the level of sedimentation depends on the year. However, most of the time this information is not available.

Column AD - Decimal degree latitude; Column AE - Decimal degree longitude: It is important to try to get this information as much as possible, because only when this information is available, the .kml file can be created which will show the location of the dam on the Google Earth map.

Column AF - Validated: to put an x if the coordinates of the dam have been validated. However, often this information cannot be given clearly, then just leave it empty.

Column AG – National reference(s); Column AH – Other reference(s): The coding for the references given in these column is explained in section 2 “Notes and references document” below.

Column AI - Internal metadata: Use to put useful information metadata for AQUASTAT, but that will not be shown in the file in the website. In fact all the columns that have a yellow cell in row 3 are only internal and will not be extracted to the external files that are on the website.

Column AI – GEO NOTES: For the one time evaporation exercise for some cases, if not exact coordinates were available, coordinates of nearby places were given. Do not fill in anymore.

Column AK – Comments: Put comments that might be useful for the external users. One type of comments can be for example The MW in case of use for hydropower, or type of dam (earth, concrete, etc.).

Explanation of the buttons at the top of the “Dams’ sheet of the file.

-Extract!: Clicking on this button prepares the Excel files and (if coordinates available) the Google Earth files, that will be put on the website. When extracting a country, the files will automatically be saved in <\\faoint0b\nr\water\aquastat\dams\country>. When extracting a region, the files will automatically be saved in <\\faoint0b\nr\water\aquastat\dams\region>. If an Excel file for the country or region exists already, it will be asked to replace and then say “yes”.

-Clean: Do not use, it refers to the macro.

-> TO DB: Clicking this button, gives an excel file with the time series of total dam capacity from 1960 to 2015 for all countries that have information on dams. After clicking the button, a first window appears asking “Until what year should I create a time series?” Automatically it says 2015, but it can be changed if time series till another year are wanted. A second window will appear that says: “Now, compare against db. If this is lower, then don’t upload any year of this country. If it is higher, then change upload entire country series.” This means:

- if the value in the time series for 2015 (or the last year selected) is lower than the total dam capacity of the country available in the database (or a new value that we may have), don’t upload time series in the database and keep or add (if it’s a new value) “Total dam capacity” in the database in the year given by the source for that value, with the corresponding source.

- If the value in the time series for 2015 (or the last year selected) is equal or higher than total dam capacity of the country in the database (or a new value that may be available), then upload the time series in the database. Use the source 6386 and the qualifier L (Modelled value). If a source is available for a country, then that national source for total dam capacity should be put instead of 6386.

Explanation of the “legend” sheet of the file

In addition to the explanation of each column, the “Legend” sheet provides an explanation of the colours in the “Dams” sheet of the file:

-Orange colour: Cells with an orange background, mean: Either the Reservoir area and/or the height and/or the capacity is probably incorrect. During the quality control exercise it became clear that it is not possible to have this combination of area-capacity-height, so either the one or the other is not correct.

-1925: The year in orange means: Approximate date. See comments for details (Column AK in the “Dams” sheet).

-Dam 1: Dam no longer operational. It was decided to not remove from the file dams no longer operational, because people might have used already previous versions and thus might get confused. Rather strikethrough and font colour in red is given in the cells of the dams and it is indicated in the comment column AK why they have been deleted: Not functional, double counted (under another name), etc. Please note that these dams are also still in the external file on the website, so users should be aware that they cannot simply add up capacity or area. They should remove the capacity and/or areas of the red strikethrough cells to obtain the correct total.

Explanation of the “Internal notes” sheet of the file

This sheet is only visible internally. In this sheet major changes from one version to the other are indicated. It is good practice to rename the file when doing major changes, so as to always being able to go back to earlier versions when a mistake appears. This was for example the case with USA dams where a mistake was discovered in V1.51, which in fact existed since V1.37 when dams from Wikipedia were added. Both double dams appeared and a huge mistake in capacity appeared from one dam, which was probably due to wrong unit. Due to this version control, it was easy to correct the mistake slipped in from V1.36 to V1.37 and thus correct V1.52.

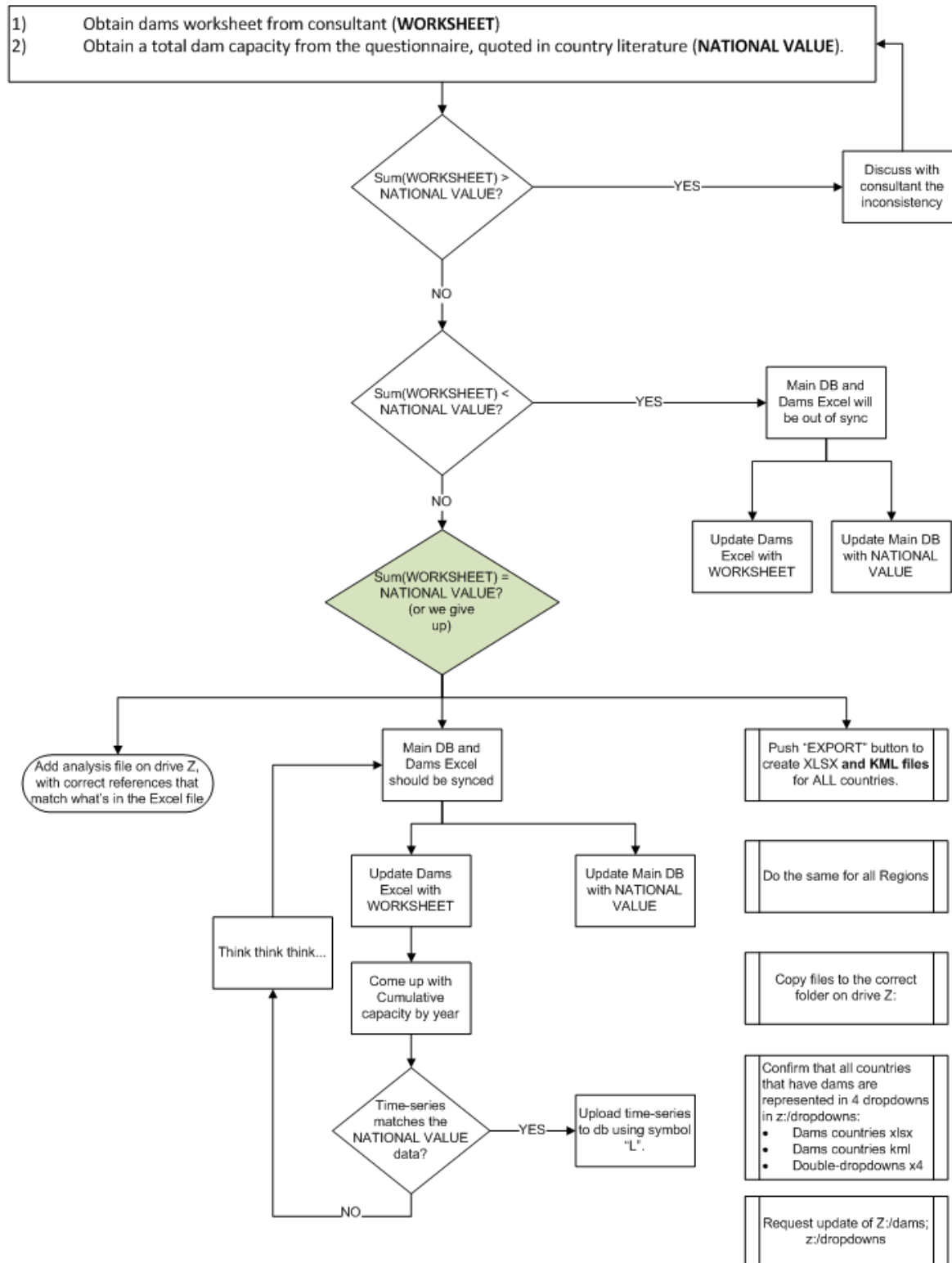
Additional comments

-Shared dams: The total capacity of dams shared between two countries is divided between the two countries (50 percent for each country), adding a comment in the column “Comments”. See for example the Kariba dam which is shared between Zambia and Zimbabwe. This is done in order to avoid that there is double counting when users add up the capacities in Column N.

-Version control: As mentioned under point 5, make sure to do correct version control by renaming the file when doing major changes. This makes it easy to correct possible mistakes in a version.

The next page shows the flowchart of the dams update methodology.

Dams update methodology – AQUASTAT 2015



5.1.2. Notes and references document

See <http://www.fao.org/nr/water/aquastat/dams/index.stm> for a “Notes and References” file for most regions. In addition to some general information, in this file are put:

-Shared dams: a summary of the shared dams in the region, so that users have a quick overview of what dams are shared between what countries in the region

-National and general references: These references are linked to a number, and in the Dams global file we put the initials of the region plus the number of the reference in column AG of the dams excel file. For example: **eu22** (if it's the 22nd reference of Europe) or **as52** (if it's the 52nd reference of Asia).

5.1.3. Monitoring dams actions

A “Monitoring Data and MD points 2016” Excel file has been created in March 2016 to keep track of actions undertaken in the database for evaluation purposes. The file has a “Dams” sheet where the dams added, deleted and updated are put for each country. The file is available in the folder <\\...\AQUASTAT\Database issues>.

5.2. The Global Map of Irrigation Areas (GMIA)

AQUASTAT GMIA related files and folders on the **Divisional shared drive** are located under:

<\\...\AQUASTAT\GMIA>

AQUASTAT GMIA related files on the **Website drive** are located under:

<\\faoint0b\nr\water\aquastat\irrigationmap>

AQUASTAT external web page on GMIA is under:

<http://www.fao.org/nr/water/aquastat/irrigationmap/index.stm>

The latest update of the Global Map of Irrigation Areas (GMIA) is Version 5.0. The major aim of the GMIA, done in collaboration with the University of Bonn, is to have irrigation areas spatially distributed. The latest update was finalized in 2013 and the number of subnational units increased to 36 090 for area equipped for irrigation, 10 316 for area actually irrigated and 14 483 for the statistics on the source of water for irrigation. The reference years for the statistics differ between countries and variables but in most cases the data refer to period 2000-2008.

The methodology is described on <http://www.fao.org/nr/water/aquastat/irrigationmap/index30.stm> and sub-national irrigation data by country can be accessed from <http://www.fao.org/nr/water/aquastat/irrigationmap/index20.stm>.

In the AQUASTAT Main Database, in the WS, data for some variables are also available at sub-national level. One of the variables is the area equipped for irrigation [4313]. However, not automatically all sub-national data obtained through the GMIA exercise have been included in the WS. It is only done when the national-level value is exactly the same in both the Main Database and the GMIA. For different reasons this is not always the case.

When AQUASTAT updates a region and has been able to get new data on [4313] and also new sub-national data, an Excel file is prepared comparing these data with the GMIA data. Also in the “Decision and checks” file new information is recorded (see section 4.1.10). These files are stored in the “0-update” folders of the region surveyed. Once collected a certain number, this information can be sent to Stefan Siebert at the University of Bonn, who is the key person for the GMIA exercise.

5.3. Country irrigated crop calendars

AQUASTAT Irrigated Crop Calendar related files and folders on the **Divisional shared drive** are located under:
<\\...\AQUASTAT\Water uses\Irrigation water use>

AQUASTAT Crop Calendar related files on the **Website drive** are located under:
\\faoint0b\nr\water\aquastat\countries_regions

AQUASTAT external webpage on the irrigation water use study is under:
\\faoint0b\nr\water\aquastat\water_use_agr\index.stm

5.3.1. Procedure to follow for updating irrigated crop calendars

1. Use ISO3 codes for the country names.
2. Put the new crop calendar of the country in the Excel file that contains all countries:
Latest available in English: UpdatedCC_eng20161013.xlsx
Latest available in French: UpdatedCC_fra20161013.xlsx
3. These files are located in the **Divisional shared drive** folder: Water uses\Irrigation water use\work 2012-2016\CC original and updated\CC updated since publication\CC_World.
4. It is good practice to save the files with a new date in the file name if major changes are to be done. In case there are non-explainable mistakes or other problems, one always can go back to a previous version.
5. Put a note at the top of the new calendar (cell D2), saying that the original used for the study can be found in the PDF and put the link of the PDF in cell N2 (See as example the sheet AUS for Australia).
6. Correct the note in the left footer at the bottom of the new calendar replacing “Prepared in [month year]” by “Updated in [month year]” in the English version and “Préparé en [mois année]” by “Mis à jour en [mois année]” in the French version.
7. Save the updated country sheet as ISO-CC_eng.xlsx, ISO-CC_fra.xlsx, ISO-CC_eng.pdf and ISO-CC_fra.pdf in the **Divisional shared drive** country folder: Water uses\Irrigation water use\work 2012-2016\CC original and updated\CC updated since publication\CC_ByCountry_NoAQLogo.
8. Save the same 4 country sheets mentioned in point 7 above also on the **Website drive** folder countries_regions\ISO, where ISO refers to the ISO3 code of the country.
9. In the entire World Excel files (mentioned under point 2 or 3), have in all country sheets the cell A1 active and save the files with the first sheet (AFG) open.
10. Save these files also to the **Website drive** countries_regions\World with the name World-CC_eng.xlsx and World-CC_fra.xlsx.

11. As soon as the Spanish version is available, do the same for Spanish.
12. Request web update for the country folders updated concerned and for the World folder.

5.3.2. Some assumptions

Note: Harvested crop areas refer to the area equipped full control irrigation [4311] or full control actually irrigated [4461] and NOT total area equipped for irrigation [4313] or actually irrigated [4318]

For the calculation of irrigated cropping intensity:

- If information on the full control area actually irrigated is available, the harvested area over full control actually irrigated area [4461] is taken
- If no information on full control area actually irrigated is available, then it is assumed that the whole area equipped for full control area is irrigated and we take harvested area over full control equipped area [4318].

Example:

If: Full control equipped area [4311]: 100 ha
 Full control actually irrigated area [4461]: 80 ha
 Harvested irrigated crop area [4379]: 90 ha
 This gives a cropping intensity of $(90/80) = 1.125$ or 112.5%

If: Full control equipped area: 100 ha
 Full control actually irrigated area [4461]: no information available
 Harvested irrigated crop area [4379]: 90 ha
 This gives a cropping intensity of $(90/100) = 0.9$ or 90%

- To calculate increase/decrease over a certain period in %:
 $= 100 \times (\text{value present year} - \text{value previous year}) / (\text{value previous year})$
- To calculate average yearly increase/decrease over a certain period in %:
 Formula: $(1+i)^n \times \text{previous} = \text{present}$, whereby i = yearly increase and n = number of years

Example: Year 1990 = 70 ha
 Year 2000 = 50 ha
 Increase over entire period = $(70-50)/50 = 0.40$ or 40%
 Average yearly increase = $(1+i)^{10} \times 50 = 70$, which give $i = 0.034$ or 3.4%

Sugarcane is considered to be an annual crop (see also the lists of temporary and permanent crops in the Main Database). The structure used by FAOSTAT is followed.

6. Website issues

AQUASTAT folders and files on the **Website drive** are located under:

<\\faoint0b\nr\water\aquastat>

AQUASTAT external webpage is under:

<http://www.fao.org/nr/aquastat>

Note: Permission to **request updates** should be given **ONLY** to the AQUASTAT Programme Manager. Write access can also be given to others, including consultants if they have an FAO account. Ask AGL-Director to request both write and update request permission by writing to Web-Intranet-Updates@fao.org. For more assistance, if needed, ask James Morgan.

6.1. Introductory remarks

In the future the AQUASTAT website will most probably have to be transformed and migrated to follow the official FAO website policy, both as far as look and as far as programme to be used is concerned.

As long as this is not yet the case, and in view of limited resources, maintaining the website and keeping all pages updated in three languages, which is a huge job, probably will have to continue to be the job for the manager during evenings and weekends...

AQUASTAT is proud of having more or less its entire website available in three languages: English, French and Spanish (except specific country profiles which in general exists only in either English or French or Spanish). It is important to continue this good practice, which is highly appreciated by the users and moreover is part of FAO's language policy.

There are many linkages between the different pages and AQUASTAT has made an enormous effort over the last years to rationalize the naming of files, storing of files, and avoiding duplicates. It is extremely important to stay disciplined in order not to lose this good practice.

It is impossible and not necessary to write specific guidelines for the website. Familiarization with the website will have to take place through self-study. Some issues have been already touched upon in different sections of this report. Just two additional specific issues are mentioned below.

6.2. Updating the asset viewer

1. The Asset Viewer is the page available here (in three languages):
http://www.fao.org/nr/water/aquastat/countries_regions/Profile_segments/index.stm
http://www.fao.org/nr/water/aquastat/countries_regions/Profile_segments/indexesp.stm
http://www.fao.org/nr/water/aquastat/countries_regions/Profile_segments/indexfra.stm
2. To update, go to the following folder:
\\faoint0b\nr\water\aquastat\countries_regions\Profile_segments

3. To gather new assets, go to Step 5
4. To modify the introduction, or top, or to change the column headers, make the changes in these files:
 - Text for indexfra.stm top.html
 - Text for indexesp.stm top.html
 - Text for index.stm top.html
5. Open the Excel file: "To make country offerings.v0.1.xls.xlsm"
6. Push the "Update assets" button at the top left.
7. After that, push the "Create new index.stm" button next to it.
8. Do the same for all languages (one in each tab).
9. Note: the first three columns CF, WRS and IRR are available for all countries (linked to the DB) and therefore all should have an X always.

6.3. Icons for the AQUASTAT website

AQUASTAT icons for the website on the **Website drive** are located under:
<\\faoint0b\nr\water\aquastat\common\images>

Below are the stats and an explanation of when what icon type is used where on the website:

➤ 37 images

1. AssetViewer
2. Chrome
3. ClimateTool
4. CountriesRegionsRiver
5. DamExcel
6. Dams
7. DataVisualizations
8. DidYouKnow
9. Excel
10. GeoNetwork
11. GlobalMapIrrigation
12. Glossary
13. GoogleEarth
14. Institutions
15. Invest
16. IrrigationDrainage
17. IrrigationWater
18. KWIP
19. MainDatabase
20. MapsSpatialData
21. Other
22. Pdf
23. Portfolios



- 24. Publications
- 25. SDG6
- 26. Sediments
- 27. Tables
- 28. UN-Water
- 29. UnWaterBriefs
- 30. Wastewater
- 31. WaterGender
- 32. WaterGender2
- 33. WaterManagement
- 34. WaterQuality
- 35. WaterResources
- 36. WaterUses
- 37. WomenWater
- 38. Workshop
- 39. Zips

➤ **4 types**

- 1. **N** Normal style (white foreground, colour background)
- 2. **N + b** Normal monochrome (white foreground, black background)
- 3. **F** Focused style (colour foreground, transparent background)
- 4. **F + b** Focused black (black foreground, transparent background)

➤ **6 sizes**

- 1. **H** Head: width=300px (note width, not height)
- 2. **T** Tile: width=60px
- 3. **L** LargeIcon: width=45px
- 4. **I** Icon: width=35px
- 5. **E** Excellent: width=26px
- 6. **S** SmallIcon: width=18px

In addition, for the 5 non-AQUASTAT icons we also have (Focused white (white foreground, transparent bg)

$37 * 6 * 4 = 888$ images

Plus whites = $5 * 6$ sizes = 30. $888 + 30 = 918$ images.

For giving the name to the icon, combine as:

- Image-type-size.extension
 - o Workshop-N-E.gif.

Exceptions:

- For monochrome images (white foreground, black background), last character is 'b':
 - o Workshop-N-E_b.gif
- For white Focused, last character is underscore:

- o Pdfs-F-S_.png

The extension is either png or gif.

Note: F icons are png, N icons are gif. This is because png is necessary for transparencies and gifs are smaller.

6.4. Updating of visualizations using R

R is a programming language and software environment for statistical computing and graphics supported by the R Foundation for Statistical Computing. The R language is widely used among statisticians and data miners for developing statistical software and data analysis.

AQUASTAT makes widely use of R for its visualizations, see for example the following visualizations on this page <http://www.fao.org/nr/water/aquastat/infographics/index.stm>:

- Transboundary surface water flow
- National renewable water resources flow
- Global dam capacities
- Irrigation areas
- Irrigated crops

Last updates of these visualizations was in 2015. The services of an R expert would be needed from time to time for updating.

7. AQUASTAT and UN-Water

7.1. Federated Water Monitoring System (FWMS) & Key Water Indicator Portal (KWIP)

AQUASTAT KWIP related files and folders on the **Divisional shared drive** are located under:

<\\...\AQUASTAT\UN-Water - FWMS-KWIP>

AQUASTAT KWIP related files on the **Website drive** are located under:

<\\faoint0b\nr\water\aquastat\projects>

AQUASTAT external webpage on the KWIP is under:

<http://www.fao.org/nr/water/aquastat/projects/index2.stm>

UN-Water external webpage on the KWIP is under:

<http://www.unwater.org/kwip> and

<http://www.unwater.org/activities/multi-agency-featured-projects/indicators/en/>

The Federated Water Monitoring System (FWMS) and Key Water Indicator Portal (KWIP) was implemented by AQUASTAT on behalf of UN-Water, with the aim to improve the clarity of water statistics between different UN agencies.

Different progress reports have been prepared that are available on the above Divisional shared drive. Below is an evaluation of the work, made in August 2014 for UN-Water. The main problem has been the lack of resources. It is the intention to continue this work within the framework of SDG 6 and more specifically using funding through the GEMI project (see section 7.3). The data is still located in the data cubes in FAO (to contact CIO for more information).

7.1.1. What was proposed to be accomplished

To provide high-quality information on a selected number of water indicators that could drive national, regional and global water policy conversations

The antecedents for this initiative were the report: [Water Monitoring, Mapping Existing Global Systems & Initiatives](#) (2006) and the [UN-Water Task Force on Indicators, Monitoring and Reporting](#) (2009). From these, a set of [15 key water indicators](#) had been identified as the set that would allow for ongoing monitoring in the water sector.

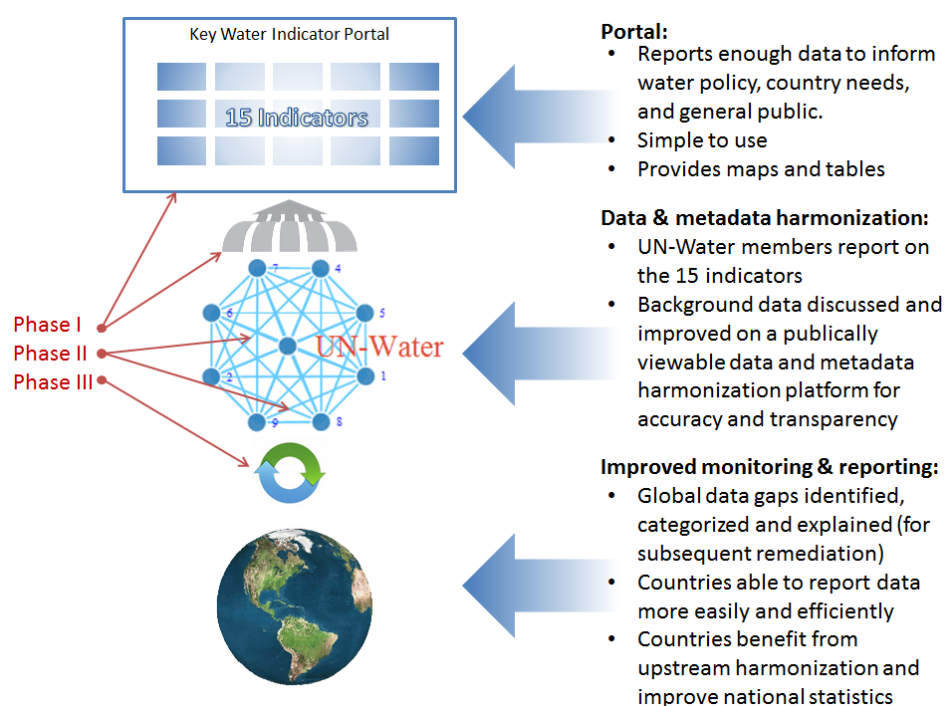
Country-level data for these 15 indicators were to be provided by UN-Water members and partners, which in turn obtained the background data from national ministries and reporting agencies. The following problems were targeted by this initiative:

- If data is siloed in different databases, it's difficult for press and officials to treat them as a set and derive the water-related linkages and challenges
- If data is siloed, it is difficult to identify, understand and harmonize any data inconsistencies

- It is difficult to get data from countries, and even more difficult to understand why data-gaps exist

These problems were to be resolved by the following phases:

- **Phase I** gathered information from relevant organizations and agencies, created the Federated Water Monitoring System (FWMS), which is the database that holds all the information that is presented in the Key Water Indicator Portal (KWIP), and created the KWIP as a demonstration of the power of joint data initiatives.
- **Phase II** is improving the information held within the FWMS through more focused harmonization sessions, and keeping better track of decisions taken.
- **Phase III** would have had two goals: a) to provide a mechanism through which conclusions of UN-Water harmonization sessions could be provided to the countries generating the data (for capacity development), and b) to generate a detailed report about global data gaps and strategies to remedy these.



7.1.2. Limitations during implementation

The scope of each phase of the project was constantly limited by two types of constraints:

Logistic: Of the 15 Key Water Indicators, only 6 indicators had responsible agencies identified: FAO (AQUASTAT) for 4 indicators and WHO/UNICEF (JMP) for 2 indicators. The other indicators were therefore excluded from the KWIP. This is part of a greater problem, collaboration with other agencies/organizations was sometimes hindered or non-existent, despite frequent and systematic attempts to gather feedback by the project coordination team. Added to this, during Phase II FAO experienced a substantial restructuring which led to delays and unforeseen changes in the project-goals delivery strategy in view of the fact that especially for the IT part the project depended to a large extent on support from the FAO IT group, which was exactly the group that was most targeted by the restructuring.

Financial: Since only UN-Water and FAO provided financial resources to this initiative, every phase was underfunded. Contributions were also requested from individual agencies that were involved in and benefiting from harmonization sessions and the resulting higher-quality data, but no agency was in a situation to provide any contributions other than their staff-time.

The limitations have proven to be severe enough to have the following effects:

- While the FWMS and the KWIP were built, it was impossible to create automatic connections to each agency. Therefore, manual data uploading is required to keep the KWIP actual.
- The harmonization platform corresponding to Phase II cannot be built. Harmonization will still be performed, albeit using a variety of other tools. Notably, this will omit the record-keeping and outward facing component of the harmonization.
- Phase 3 is cancelled since FAO cannot continue investing resources for this initiative, and financial resources required to fully address the needs of this project have not been forthcoming.

7.1.3. Lessons learned

- Harmonization is best performed in the presence of **contextual metadata**. Metadata adds clarity by allowing for further explanations, accuracy and usability criteria, and comparability issues. This work by major data providers is a pre-condition for any attempt to develop a FWMS and, being in line with its mandate, efforts should be made by UN-Water to pursue this work.
- A precondition that needs to be filled is obtaining **baseline data** for all 15 indicators and then the continuation of the **monitoring**. This will need to be done in full consideration of the forthcoming decisions on SDGs.
- The fact that the KWIP was one of the **most-visited pages** on the UN-Water website for years, confirms that people are hungry for data, not for analyses. Everyone is an analyst, from country-level experts to students and reporters, but there are very few high-quality data generators. It also confirms that people highly appreciate the one-entry point for water-related data. This is in line with UN-Water's mandate and therefore the justification for such a system remains valid.
- **Generation, collection, harmonization, and dissemination of data are expensive, difficult under-appreciated tasks.** This leads to a trend to reduce the amount of quality assurance in favour of having a larger list of publications. It is of paramount importance that this trend be reversed, especially in the face of "linked data". It should be kept in mind that while the cost of high-quality data is high, the cost of bad policy derived from bad, incomplete or simply wrong data is much much higher. Given the long-term nature of such initiative, arrangements should be made for a more secure and permanent funding mechanism.

7.2. UN-Water Country Briefs (WCB)

AQUASTAT WCB related files and folders on the **Divisional shared drive** are located under:

<\\...\\AQUASTAT\\UN-Water - WCB>

AQUASTAT WCB related files on the **Website drive** are located under:

<\\faoint0b\\nr\\water\\aquastat\\projects>

AQUASTAT external webpage on the WCB is under:

<http://www.fao.org/nr/water/aquastat/projects/index3.stm>

UN-Water external webpage on WCB is under:

<http://www.unwater.org/activities/multi-agency-featured-projects/country-briefs/en/>

The UN-Water Country Briefs (WCB) was implemented by AQUASTAT on behalf of UN-Water, with financial support from the United States Department of State (USDS), with the aim to better visualize the critical importance of “investments in water” for human and economic development.

During the pilot phase briefs have been prepared for thirteen countries, which are: The Gambia, Ghana, United Republic of Tanzania and Zambia in Africa; Chile, Guyana and Mexico in the Americas; Bangladesh, Kyrgyzstan, Mongolia, Oman, Philippines and Viet Nam in Asia.

The briefs for all countries can be accessed both from the AQUASTAT website and the UN-Water website mentioned above.

As a follow-up the **Global Water Partnership (GWP)** intended to prepare briefs for an additional thirteen countries: Benin, Cabo Verde, Chad and Kenya in Africa; Brazil and Guatemala in the Americas; Indonesia, Nepal, Tajikistan and Uzbekistan in Asia; France in Europe. AQUASTAT was still requested by UN-Water to do the quality control. Unfortunately it proved that GWP did not have the capacity to correctly implement the task.

7.3. The GEMI project on Monitoring SDG 6.3-6.6

AQUASTAT GEMI related files and folders on the **Divisional shared drive** are located under:

<\\...\AQUASTAT\UN-Water - GEMI>

AQUASTAT GEMI related files on the **Website drive** are located under:

<\\faoint0b\nr\water\aquastat\projects>

AQUASTAT external webpage on GEMI is under:

<http://www.fao.org/nr/water/aquastat/projects/index.stm>

UN-Water external webpage on GEMI is under:

<http://www.unwater.org/gemi/en/> and

<http://www.sdg6monitoring.org/>

The Integrated Monitoring initiative (GEMI) was established as an inter-agency initiative composed of FAO, UNEP, UNESCO, UN-Habitat, UNICEF, WHO and WMO, operating under the UN-Water umbrella, to monitor several targets of SDG6. FAO-AQUASTAT is responsible for the Target 6.4 in the GEMI project. More information on the project is on the AQUASTAT webpage, indicated above.

FAO has recruited a P-4 project coordinator under the GEMI project and the AQUASTAT Programme Manager is the Lead Technical Officer for this project.

7.4. AQUASTAT collaboration with UNSD and with Eurostat

AQUASTAT collaborates with UNSD on a regular basis to compare data on common variables and indicators. While collaboration was intensified during the KWIP project (see section 7.1), AQUASTAT

still continues to analyze data from **UNSD-UNEP questionnaires** and make a comparison with data AQUASTAT obtains. Focal point in UNSD: Reena Shah (shah@un.org).

AQUASTAT has regular exchanges with UNSD on the System of Economic-Environmental Accounting for Water (SEEAW) (<http://unstats.un.org/unsd/envaccounting/seeaw/seeawaterwebversion.pdf>) and has been involved in the elaboration of the International Recommendations for Water Statistics (IRWS) (<http://unstats.un.org/unsd/envaccounting/irws/irwswebversion.pdf>). Focal point in UNSD: Alessandra Alfieri (alfieri@un.org).

AQUASTAT collaborates with Eurostat on a regular basis to compare data on common variables and indicators. While collaboration was intensified during the KWIP project (see section 7.1), AQUASTAT still continues to analyze data from **Eurostat-OECD questionnaires** and make a comparison with data AQUASTAT obtains. Focal point in Eurostat: Jürgen Förster (Juergen.Foerster@ec.europa.eu).

8. AQUASTAT and the IDWG on Statistics, its Technical Task Force and Working Groups

AQUASTAT IDWG-Statistics related files and folders on the **Divisional shared drive** are located under:
<\\...\\AQUASTAT\\IDWG Statistics>

Information on the Statistical Technical Network (STN) is on the **FAO Workspace**:
<https://workspace.fao.org/SitePages/fao-workspace.aspx>
Under the category: Technical Networks

8.1. DG Bulletins and Administrative Circulars

Below are the links to two DG bulletins and two Administrative Circulars with respect to the coordination of statistical activities at FAO and the Inter-Departmental Working Group on Statistics and the Technical Task Force.

- DG Bulletin No. 59 of 12 November 2012: ***Establishment of the role of Chief Statistician at FAO Headquarters***
http://intranet.fao.org/fileadmin/user_upload/FAO_Communications/dgb/dgb12_59.pdf
- DG Bulletin No. 60 of 12 November 2012: ***Establishment of the Inter-Departmental Working Group on Statistics***
http://intranet.fao.org/fileadmin/user_upload/FAO_Communications/dgb/dgb12_60.pdf
- Administrative Circular No. 05 of 31 January 2014: ***Questionnaires and other requests for statistical information***
http://intranet.fao.org/fileadmin/user_upload/FAO_Communications/ac/AC14_05.pdf
- Administrative Circular No. 22 of 03 November 2015: ***Accountability framework for FAO statistical activities***
http://intranet.fao.org/fileadmin/user_upload/FAO_Communications/ac/AC15_22.pdf
- DG Bulletin No. 43 of 9 December 2016: ***New office of Chief Statistician (OCS)***
http://intranet.fao.org/fileadmin/user_upload/FAO_Communications/dgb/dgb16_43.pdf.
This bulletin mentions: “A new Office of Chief Statistician (OCS) to separate the coordination functions of the Chief Statistician from the line functions of the head of the Statistics Division (ESS), is created, reporting directly to DDP”.

8.2. Inter-Departmental Working Group (IDWG) on Statistics and Technical Task Force

Contact point in ESS for IDWG: Stephen Katz

See email address of the IDWG-Statistics (IDWG-Statistics-List@fao.org) to see the members of the IDWG-Statistics.

See email address of the IDWG-Technical (IDWG-Technical-List@fao.org) to see the members of the Technical Task Force.

The Technical Task Force has five sub-groups:

1. Data collection (coordinated by Valentina Ramaschiello, ESS)
2. Quality & Methods
3. Classification & Standards
4. Statistical Capacity Development
5. Indicators to monitor FAO-relevant SDG targets (coordinated by Carlo Cafiero, ESS)

Due to time constraints AQUASTAT is active member of group 1 and 5 only, but all groups are important for AQUASTAT and AQUASTAT provides input upon request. Information on the different groups is available through the Divisional shared drive mentioned at the beginning of this chapter.

Both the FAO website and the AQUASTAT website have a tab “Statistics” at the top which contains useful information: <http://www.fao.org/statistics/en/>.

The membership of the IDWG on Statistics is at Director level and technical officers may participate in the IDWG meetings when necessary. The IDWG delegates the implementation of all necessary actions stemming from its strategic directions to the technical task force (TFF). This permanent TFF meets regularly to deal with specific technical issues. Participation will be at technical level. The TORs of the TFF is available on the above Divisional shared drive in the folder “IDWG Meetings and Notes”.

A “Quality Assessment and Planning Survey (QAPS)” took place in 2016 and AQUASTAT came out in the Top 5 FAO “best practice” data collection activities. See the Excel file in the QAPS sub-folder of the IDWG-Statistics shared drive mentioned at the beginning.

One ongoing issue that has to continue in 2017 is the revision of the AQUASTAT data collection questionnaire (see section 4.1.2), following an evaluation of FAO statistical questionnaires undertaken by a consultant (from ISTAT) through ESS. Although AQUASTAT was very highly ranked (top 5), there are still some issues that need to be improved. This is explained in column Q of the file “FINAL QUESTIONNAIRE SCOREBOARD.xlsx”, prepared by the consultant and available in the “Questionnaires review” folder of the above shared folder on IDWG Statistics. Contact point in ESS: Valentina Ramaschiello.

A **Statistics Coordination Portal** is being created on the Intranet, where information can be shared.

8.3. The Statistical Working System

Contact point for SWS in ESS: Giorgio Sorbara

The Statistical Working System (SWS) provides an end-to-end solution for:

- Inputting and storing raw data
- Performing automated calculations
- Providing data that is ready for dissemination

SWS is comprised of:

- Database: Stores raw input data:

- R Server: centralizes and saves methodologies and automatically outputs prepared data
- SWS Server: coordinates between Database and R sever and provides web interface for end users

The benefits of SWS are:

- ✓ Improve the way officially reported national time-series statistics for agriculture are handled
- ✓ Improve data quality by creating, revising and centralizing standards, metadata standards, and statistical methods that underpin the processing of agricultural statistics
- ✓ Align with international standards and best practices
- ✓ Reduce the overall burden on reporting countries

AQUASTAT has had a few meetings with the SWS team, led by Giorgio Sorbara. The SWS team is evaluating how it could be of use for AQUASTAT and further meetings will take place from mid-2017 onwards. Some documents are available in the “Statistical Working System” folder of the AQUASTAT “Database issues” folder.

8.4. FAO Statistical Programme of Work

AQUASTAT contributes actively to the elaboration of the FAO Statistical Programme of Work (SPW), which is prepared for every biennium. The latest one external is the one for 2014-2015 <http://www.fao.org/3/a-i4045e.pdf>, but internally also the one for 2016-2017 is available and information can be found in the “Statistical Programme of Work” sub-folder of the IDWG-Statistics shared drive mentioned at the beginning. More information is available on <http://www.fao.org/statistics/en/>.

AQUASTAT has been criticizing the structure of the SPW 2014-2015. An email written on this on 17 April 2014, which might give a better understanding, is copied below. Unfortunately the structure for the 2016-2017 programme is not much different.

From: Frenken, Karen (NRL)
Sent: 17 July 2014 18:41
To: Statistical-Program-Work <Statistical-Program-Work@fao.org>
Cc: NRL-Director <NRL-Director@fao.org>; Unver, Olcay (NRL) <Olcay.Unver@fao.org>; BonannodiLinguaglossa, Giulia (NRL) <Giulia.BonannodiLinguaglossa@fao.org>
Subject: RE: Draft: Feedback on the FAO Statistical Programme of Work 2014-15

Dear Pietro and SPW Team,

First of all congratulations with the work done so far. I know it is a huge challenge trying to combine in this FAO Statistical Programme of Work (SPW) 2014-2015 the multitude of statistical activities that are going on in the organization.

I would like to make a few comments, mainly as a result of the fact that I now have seen all the activities put together in the document:

1. **Country programmes:** FSNAU Somalia appears five times in the list, while I think that this SPW document should concentrate on global programmes. If looking at country-level programmes, there are without any doubt many others that can be added (for example, just to stay within the same country, there is also SWALIM: Somalia Water and Land Information Management www.faoswalim.org/). However, I am not in favour of that. As you know, one of my criticisms of data.fao.org is/was that it is a potpourri, putting a small data collection project in a village in a country at the same level as a global information system. Therefore, I would like to insist to not put individual country programmes or, if you from your side insist on including them, then to put them as a separate category



(and then I think many people would like to add some...). In that case, they also should not be linked to a specific division, but to the national/regional FAO office concerned (also respecting the decentralization spirit...).

2. **Multitude of activities:** I am surprised to see the multitude of activities put separately, while I think many of them could or should be combined. Chapter 6 “Some key facts about the SPW 2014-2015” deals with comparing all these activities and the way it is done now gives a distorted picture to users, especially external users who are not familiar with the FAO statistical system and set up. On page 13 you make a remark on this (referring to the “certain degree of arbitrariness”), but it is hardly visible. In fact, looking at the other activities, I could easily split AQUASTAT into at least 10-15 separate activities (if you want I can mention them to you), under function 1 and 2 especially, and you will notice that this would change considerably the different graphs you made. However, all three NRL-related evaluations that took place over the last 10 years (the NRL/AGL Information Systems Auto-Evaluation in 2004-2005, the Statistics Evaluation in 2007-2008 and the Water Evaluation in 2009-2010), commended the Water Unit of NRL for the fact that it has one entry point for all water-related data and statistics, which is AQUASTAT. Also, if you look at the description of AQUASTAT in the SPW (page 171-176), you will notice that it combines many activities, which easily could be put as separate activities. However, while I do not want to do that, even the more so because of the positive feedback from the three evaluations on the one entry-point, I think that during the preparation of the next SPW the SPW Team has to deal better with this “arbitrariness” issue, taking advantage of its gained experience by then, and in the meantime in the present document Chapter 6 should be modified, since it gives a too distorted picture. Also, I have problems with the function “Dissem/IT system” in the appendix. Why are web sites, such as Statistics Division website, CountryStat website, etc., given there? AQUASTAT also has a website, AQUASTAT also has a working system and a dissemination system. So, what in fact is the difference?
3. **Function 1-5:** I was, and still am, hesitating whether there should be a separate section for AQUASTAT under function 2 “Statistical methodologies and standards”, since AQUASTAT prepares a lot of guidelines and methodological papers. During preparation I had shared my hesitations with the SPW Team, but then we decided together that maybe it could remain all together as it has been done now. But I continue hesitating, especially now that I saw what the other activities are that have been put there... The same, although to a lesser extent, is true for function 3 “Data analysis” and function 4 “Capacity development”. For now, AQUASTAT has only been put under function 1 “Data collection and dissemination” and while I’m tempted to keep it like that, I’m open to and in fact would appreciate your view.

I hope you find my feedback, aimed at continuously improving FAO Statistics, constructive. I was happy with the interaction with the SPW team during the preparation.

Thanks and regards,

Karen

8.5. World Programme for the Census of Agriculture

AQUASTAT has been actively involved in the preparation of the programme and guidelines of the World Programme for the Census of Agriculture 2020 (WCA 2020) (<http://www.fao.org/world-census-agriculture/wca2020/en/>) and was also involved in the one for 2010 (<http://www.fao.org/world-census-agriculture/wca2020/wca2010/en/>), in order to make sure definitions and concepts relative to irrigation are conform to the ones used in AQUASTAT.

More specifically, for WCA 2010 AQUASTAT has been involved in the preparation of Theme 2 of Chapter 11 (<http://www.fao.org/3/a-a0135e.pdf>), and for WCA 2020 AQUASTAT has been involved in the preparation of Theme 3 of Chapter 8 and also Chapter 9 (<http://www.fao.org/3/a-i4913e.pdf>), in order to make sure definitions and concepts relative to irrigation are conform to the ones used in AQUASTAT.

See the “Censuses” table of “Water and gender” page for more information on possible use of the results of the WCA: <http://www.fao.org/nr/water/aquastat/gender/index3.stm>.

9. AQUASTAT and SDG Target 6.4

Information on FAO's SDG group is located on the **Divisional shared drive** under:

<\\...\\AQUASTAT\\IDWGStatistic\\SubGroupSDGs>

Information on MDG and SDG reporting is located on the **Divisional shared drive** under:

<\\...\\AQUASTAT\\Statistics requests>

Sub-folder "MDG Indicator 7.5" and sub-folder "SDG Indicator 6.4.2".

Information on the UN-Water GEMI project is located on the **Divisional shared drive** under:

<\\...\\AQUASTAT\\UN-Water - GEMI>

AQUASTAT SDG related files on the **Website drive** are located under:

<\\faoint0b\\nr\\water\\aquastat\\projects>

AQUASTAT **external web page** on SDG Target 6.4 is under:

<http://www.fao.org/nr/water/aquastat/projects/index.stm>

9.1. AQUASTAT and FAO and SDG 6.4

Contact point for SDG 6.4 in ESS: Dorian Kalamvrezos Navarro

FAO (through AQUASTAT) is the custodian for SDG Target 6.4, which in December 2016 had two indicators and there might be a possibility to have a third indicator. Regularly actions have to be undertaken at the request of the ESS Director/Chief Statistician and the programme advisor to the Chief Statistician (Dorian Kalamvrezos Navarro at ESS).

The DG has approved to give US\$ 100 000 for each indicator to be spent on capacity development activities. This means US\$ 200 000 for the two indicators 6.4.1 and 6.4.2. A general guideline is that the US\$ 100 000 per indicator should be spent on two types of capacity development activities: the production of an e-learning course (up to US\$ 40 000) and the organization of a training workshop at FAO HQ with selected country officials (up to US\$ 60 000). Work is ongoing. More information is available in the folder mentioned above. AQUASTAT started working with OPCC on the development of the eLearning course. Contact point in OPCC: Beatrice Ghirardini.

9.2. AQUASTAT and reporting to UNSD on MDG 7.5 and SDG 6.4

Yearly reporting on the MDG Water Indicator 7.5 was done as shown in the Excel files in the sub-folder "MDG Indicator 7.5" of the shared drive mentioned in the beginning. The latest reporting file is 7_5_MDG_FAO_Water_20150331.xlsx and refers to the last reporting for the MDG in 2015. This same sub-folder contains also information on the preparation of the storylines for the MDG annual reports. The last MDG report is the one for 2015 available here: <http://bit.ly/2hM7dEO>.

Link to MDG metadata: <http://unstats.un.org/unsd/mdg/Metadata.aspx?IndicatorId=0&SeriesId=768>

The first yearly reporting for SDG 6.4.2 was done in 2016. The first SDG report is available here: <http://bit.ly/2hM7Ga4>. The Excel file submitted is SDG_Indicator_6.4.2_FAO_20160530.xlsx in the

sub-folder “SDG Indicator 6.4.2”. The sheet “2016 by country” contains the data of variable [4275] “Freshwater withdrawal as % of total renewable water resources”. In fact, this variable is still the MDG indicator and not yet the SDG 6.4.2 indicator, since it doesn’t deal yet with the environmental requirement. But that methodology is still under development. Back-changes will have to be made once the new methodology, including environmental water requirements, established and applied by the countries.

While freshwater resources by country in the denominator refer to variable [4188] “Total renewable water resources”, freshwater resources by region in the sheet “2016 by region” refer to the sum of the country values of variable [4157] “Total internal renewable water resources (IRWR)”. However, some manual adjustment needs to be made in the case of agreements between countries and especially in the case that river basins are spread over different regions. This is for example the case for the Nile River basin, which is located in both Northern Africa and Sub-Saharan Africa. In that case the amount agreed for Egypt should be added to Northern Africa and deducted from Sub-Saharan Africa.

One issue that has to be dealt with are the time series. Until now, and as can be seen in the above Excel file *SDG_Indicator_6.4.2_FAO_20160530.xlsx*, for countries data are given for the years for which data are available. For regional values only “Latest values” are given, since the database is not full. This means that for one country the latest value can be 1990 and for another it can be 2015. However, for the SDG monitoring time series will be needed. That is what monitoring means. A methodology has to be developed on how to fill the cells for the years for which no data is available. This is an important task to be done in 2017. In principle, 2017 is the year for the baseline for the SDG indicators, but in case there is no reporting by countries, either for the baseline or for successive years, a methodology needs to be developed in order to be able to have regional time series. Assistance can be asked to ESS. One document under preparation is the file “FAO Quality indicators - Short 2016-11-24 clean.docx”, available in the TT Statistics Standards folder of the above folder on IDWG Statistics.

A serious issue is the incredible amount of country Quality Control work that will have to be dealt with by AQUASTAT as custodian for 6.4. To compose the two indicators 6.4.1 and 6.4.2, data for many different variables are required and these all have to go through a solid validation process. If there are no additional resources for staff to be recruited for this, then it will be impossible to keep up to the standards.

Link to UNSD SDG database: <http://unstats.un.org/sdgs/indicators/database/>

A request should be made to be added to the UNSD SDG focal point email list. Write to: Matthias Reister (reister@un.org) or Zin Lin (lin@un.org) or Heather Page (pageh@un.org).

9.3. AQUASTAT and the UN-Water GEMI Project on SDG 6.4

AQUASTAT GEMI related files and folders on the **Divisional shared drive** are located under:
<\\...\\AQUASTAT\\UN-Water - GEMI>

AQUASTAT GEMI related files on the **Website drive** are located under:
<\\faoint0b\\nr\\water\\aquastat\\projects>

AQUASTAT external webpage on GEMI is under:

<http://www.fao.org/nr/water/aquastat/projects/index.stm>

UN-Water external webpage on GEMI is under:

<http://www.unwater.org/gemi/en/> and

<http://www.sdg6monitoring.org/>

The Integrated Monitoring initiative (GEMI) was established as an inter-agency initiative composed of FAO, UNEP, UNESCO, UN-Habitat, UNICEF, WHO and WMO, operating under the UN-Water umbrella, to monitor several targets of SDG6. FAO-AQUASTAT is responsible for the Target 6.4 in the GEMI project. More information on the project is on the AQUASTAT webpage, indicated above.

FAO has recruited a P-4 project coordinator under the GEMI project and the AQUASTAT Programme Manager is the Lead Technical Officer for this project.

10. General information about AQUASTAT

General information on AQUASTAT is located on the **Divisional shared drive** under:

<\\...\\AQUASTAT\\AQUASTAT General>

General information on AQUASTAT-related files on the **Website drive** are located under:

\\faoint0b\\nr\\water\\aquastat\\About_us

AQUASTAT **external web page** on “About AQUASTAT” is under:

http://www.fao.org/nr/water/aquastat/About_us/index.stm

10.1. AQUASTAT-related links

AQUASTAT folders on the **Divisional shared drive** are located under:

- ➔ \\hqfile1\\AGL\\Initiatives_Promotions\\Initiatives\\AQUASTAT
 - **Note:** “AGL” will most probably change to “CBL” in the above link, following the decision at the Council in December 2016 to create a new Division “CBL”. For this reason, in the rest of this document the shared drive link is indicated just as: <\\...\\AQUASTAT\\...>

AQUASTAT folders on the **Website drive** are located under:

- ➔ <\\faoint0b\\nr\\water\\aquastat\\>
 - Contact point in OCC: Web-Intranet-Updates@fao.org (see chapter 6).

AQUASTAT internal database, the **Working System (WS)**, is located under:

- ➔ <http://www.fao.org/nr/water/aquastat/work/query/index.html>
 - Contact point in CIO: Giorgio Lanzarone (see chapter 1).
 - **Note:** If the Main Database (either internal or external) is down, raise a ticket through FAO Service Desk (<http://bit.ly/2hv6IMw>). If really needed, send a follow-up email to Giorgio Lanzarone.

AQUASTAT generic **FAO email** address:

- ➔ Aquastat@fao.org
 - Raise a ticket through AGL-Director asking to have permission to manage this generic email address

AQUASTAT **Twitter** Account:

- ➔ <https://twitter.com/FAOAQUASTAT>
 - Password will be, provided when successor arrives, if s/he wants to continue tweets

AQUASTAT **RSS** Feed:

- ➔ RSS feeds can be prepared through the Excel file “rss maker.v.xx.xls”, located in the folder <\\faoint0b\\nr\\water\\aquastat\\rss>. It needs to be prepared in three languages, by going to the three different sheets of that file. When pushing the “Publish” button, it also will be



shown automatically on the home page <http://www.fao.org/nr/aquastat> in the three languages under “Website updates”:

- English: http://www.fao.org/nr/water/aquastat/rss/AQ_rss.xml
- French: http://www.fao.org/nr/water/aquastat/rss/AQ_rssfra.xml
- Spanish: http://www.fao.org/nr/water/aquastat/rss/AQ_rssesp.xml

10.2. About AQUASTAT

A dedicated “About AQUASTAT” webpage has been created, http://www.fao.org/nr/water/aquastat/About_us/index.stm, to provide more information on the programme, its products, history and challenges. It also contains a site map, which has to be updated if new pages are added to the website.

10.3. Understanding AQUASTAT

Four documents on AQUASTAT that may be useful for a new manager to get a quick understanding are:

1. The above mentioned “About AQUASTAT” pages. A list of programmes that use AQUASTAT and that may ask assistance from AQUASTAT from time to time for data or other is given at the bottom of the first page: http://www.fao.org/nr/water/aquastat/About_us/index.stm.
2. The note “Understanding AQUASTAT”: <http://www.fao.org/3/a-bc817e.pdf>
3. The document that was submitted for the Stockholm Water Prize in 2015 “**AQUASTAT – THE global water data and information system, with reliable global water data and information for all!**” AQUASTAT was one of ten shortlisted for the prize and had prepared a document that, in addition to its major products, gave summary of about 75 pages with User Examples. The document also contains letter of people/institutions that wrote supporting letter for AQUASTAT for the Stockholm Water Prize. The document can be found in the folder [\\...\\AQUASTAT\\AQUASTAT General\\Stockholm Water Prize\\Prize 2015 submission](#).
4. The document “AQUASTAT: Looking forward” prepared in September 2016 and available in the Divisional shared folder mentioned at the beginning of this chapter.

10.4. AQUASTAT: Looking forward

In 2016 a consultancy took place with the purpose to prepare a report on the future of AQUASTAT, including inputs for a partnership and fundraising strategy. For this work also a user survey using SurveyMonkey was held. The final report including the results of the survey are available in the folder: [\\...\\AQUASTAT\\AQUASTAT General\\Looking forward](#).

The same folder contains some example concept notes for funding and for institutionalization of AQUASTAT, which could be used for example for the preparation of a note for COAG, which is one of the recommendations of the above consultancy.



Food and Agriculture
Organization of the
United Nations

AQUASTAT