SECOND NATIONAL CONSULTATION DIALOUGE in Slovenia

1. General Data

Country:	**Slovenia**
Organizer:	**GWP Slovenija, DMCSEE**
Date & Place:	**3 December 2014, Ljubljana**
Participants: (name & institution & email)	Number of participants: 45, 16 of them participants from GWP Slovenian partners: Government bodies 6 National institutions 18 Research institutes 11 Municipalities 1 Companies 3 NGOs 4 Civil society 2
Attachments: (attendance list, photos, etc.)	1. Invitation 2. Abstract NC 1 3. Attendance list with signatures and E mail addresses 4. Attendance list with English names of Institutions 5. Photos 6. Publication with information for participants

2. Agenda

Objective : *Presentation and discussion about the draft of the Guidelines for Drought Management Plans with the aim to contribute to its completion – elaboration of comments to the Guidelines and provide national experience according to the templates in Annexes I – VI*

Special objectives: Presentation of the new findings in the field of hydrological data, preparation process of preparation RBMP 2015 and already implemented measures to reduce the impact of drought on agriculture.

Moderator: Tanja Cegnar

- 9:00-9:30: Registration of participants
- 9:30-9:40: Welcome, Why we are here again? Martina Zupan, GWP Slovenia
- 9:40-9:50: Summary of Program Integrated Drought Management where we are now, Sabina Bokal, GWP CEE
- 9:50-10:05: Impact of climate change on the water regime in Slovenia, Mira Kobold, Slovenian Environment Agency
- 10:05-10:50: Presentation of the draft guidelines for the preparation drought management plans, Andreja Sušnik, Gregor Gregoric, Slovenian Environment Agency
- 10:50 -11:05: Technological measures to reduce drought impact, B. Ravnik, Slovenian Chamber of Agriculture and Forestry

- 11:05-11:20: Proposals of changes in legislation on drought management, Ana Jakšič, Administration for Civil Protection and Disaster Relief of the Republic of Slovenia
- 11:20-11:35: Water Management Plan 2015 Darja Stanič-Racman, Ministry of the Environment
- 11:35-12:05: Cofee break
- 12:05-13:05: Panel discussion (Panelists: Gregor Gregorič, Lučka Kajfež Bogataj, Andreja Sušnik, Darja Stanič Racman. Hermina Oberstar)
- 13:05-13:20: Conclusions

Main points of discussion:

Guidelines for Drought Management Plans, Effective measures for adaptation to drought conditions in Slovenian

3. Report (max 3000 characters)

At the outset, were presented the conclusions of the First National Consultation in February 2014 (Zupan), and the IDM program (Bokal). After that the different aspects of water management and drought linked to the guidelines for the preparation of a drought management plan, which is the main issue of discussion in the 2nd National Consultation (Kobold, Sušnik, Gregorič, Stanič-Racman). Difficulties encountered in taking action when drought occurs were also presented (Jakšič) and some already implemented and operational technological measures in the agriculture (Ravnik).
The presentations were followed by a panel discussion attended by panelists Gregor Gregorič, Lučka Kajfež-Bogataj, Andreja Sušnik, Darja Stanic-Racman and Hermina Oberstar.

Messages from the panel:
Drinking water has a constitutional right and priority over all other uses, which are equivalent. In the RBMP all sectors should be treated equally, although after development plans they will not have equal priorities. We need to establish a platform where stakeholders could propose priorities for water uses, at least at the local level.

Slovenia has not yet established an early warning of drought, which is a big disadvantage, and it is still not legally defined. On the other hand, the monitoring is improving, also the weather forecast and water balance. Agricultural drought in Slovenia is specific in comparison with other countries (short-term summer drought, to which is exposed a large part of agricultural activity). Establishment of the agro-portal with all the information regarding natural disasters would facilitate the operation of farmers. A very important element of adaptation to climate change is awareness raising and education.

Water management must not be limited to one currently “popular” problem (flood, drought), but without exception, all aspects must be taken into account in an equivalent manner.

About Climate Change we have enough good data and research, but they are not used in adequate degree in policy decisions yet. The reason is probably poor awareness of decision-makers and stakeholders. They are unaware of the importance of sustainable water management and adaptation to climate change to reduce the effects of extreme weather events. They also did not recognize the fact that water can be Slovenian opportunity. Decision makers must accept the fact that the adaptation to climate change on a preventive basis is much

cheaper than the curative one. They have to adopt the necessary rules of sustainable development and the current economic benefits must not be priority. We should learn from nature and consider natural dynamics.

The cheapest way of flood prevention is to let the natural movement of water wherever possible, and on the other hand to store rain water for drought periods.

Irrigation is unnatural process and before deciding on this the investigation on the possibility of raising the level of groundwater should be made. We have to decide as much as possible on "no regret measures", which are economically and environmentally appropriate. Decisions on measures must be prepared for spatial units based on meteorological and hydrological conditions. The measures adopted must be based on understanding, accepting and support at all levels of governance.

Last but not least regional integration, transfer of knowledge and experience, both good and bad, would help in improving the management of drought in Slovenia. Strong support was given to the continuation of the project IDMP, which could contribute to the improvement of the situation in the country and in the region. Knowledge and experience obtained in the project could also be transferred to the neighboring regions and countries.

4. Conclusions

Outcome of the public consultation:

By organizing both NCDs we have managed to establish communication between the sectors at the governmental, local, professional as well as non-governmental level. Participants expressed a wish for more of such consultations and they expect to continue with this in the future. Consultation has also contributed to the fact that the problem of weather-related disasters will be included to the RBMP 2015.

Brief information about actual status of production of DMP:

Drought Management Plan (as part of the RBMP) for Slovenia will not be prepared, mainly because it should be due to the large diversity in climatic conditions of Slovenia prepared for more units of the country, and not only for the river basins (this fact was already recognized by agricultural sector) and for this is not enough time as for the RBMP 2015 deadline. However, the drought issues will be considered in 2015 RBMP as a problem and the prevention measures for mitigating the consequences will be proposed. The sustainable use of water resources and adaptation to climate change will be taken into account as well. This is already foreseen in both the European and Slovenian legislation.

Proposals for further steps focused on elaboration of (comments to the draft of the Guidelines and national experience according to the templates in Annexes I – VI)

Templates for elaboration of the national experiences included into Annexes of the Guidelines

Annex I: Examples of the national methodologies for assessment of historical drought
Country: SLOVENIA

In Slovenia in the last decade the number of years with agricultural drought increased, and five times after the year 2000

attained the extension of natural disaster. The agricultural production on affected farmlands was hindered due to drought events and often resulted in major yield decrease and economic losses.

Short methodology of assessment of long-term series of meteorological data or picture illustrating evaluation of the historical data for the chosen parameters/indicators:

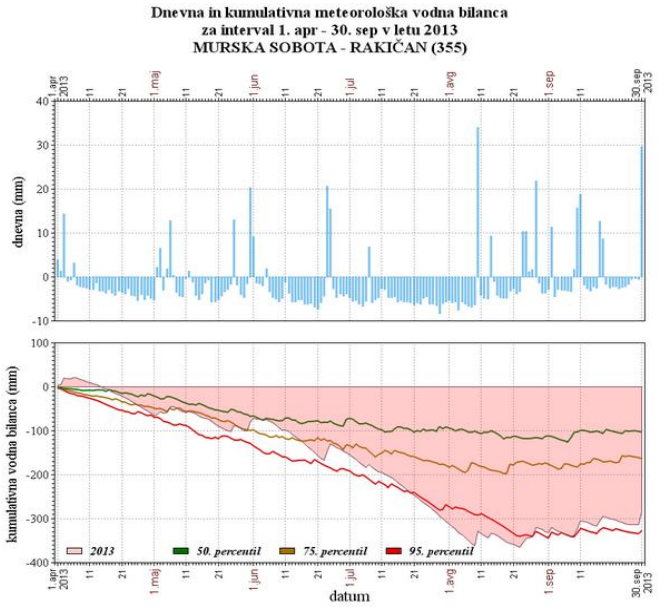
Long-term data availability : meteorological and hydrological archive of Slovenian Environment Agency 1961-2014
Precipitation distribution is one of the basics identifiers of drought occurrences in a given region. For this purposes **precipitation totals in different time scales, anomalies (decline from long-term average, share of precipitation (less than 70 ≤ 70 %) in vegetation period, percentiles)** and **Standardized precipitation index (SPI)** are used.

Example 1: Precipitation totals (mm) in the vegetation period of winter wheat (from 2nd decade of March to 2nd decade of July) in the years from1961 to 2013 for Rateče (NW) and Portorož (SE) locations with statistically significant linear trend (Source: Sušnik, 2014).

Example 2: **Share of precipitation** (%) in the vegetation period of grass (from 1st decade of April to 2nd decade of September) in the years from 2003 to 2013 for some meteorological stations in Slovenia. Years with ≤ 70 % of precipitation related to the reference period 1971–2000 are marked with * in the orange frames (dry vegetation periods) (Source: Sušnik, 2014).

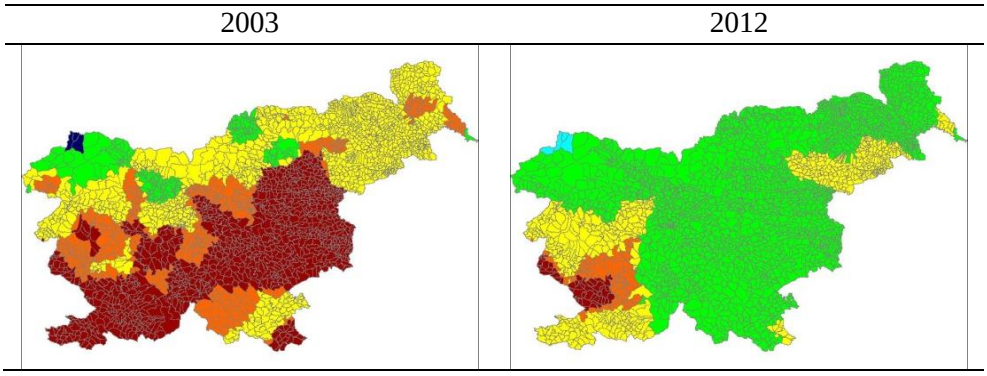
Year/Location	RA	BI	LJ	NM	ČR	CE	MB	ŠSG	MS	PO
2003	134	44*	73	68*	66*	53*	81	89	71	56*
2004	115	84	105	81	93	85	100	122	90	70*
2005	100	96	134	139	132	143	121	122	126	102
2006	78	57*	103	116	111	101	93	109	134	107
2007	105	78	95	100	119	106	109	138	113	94
2008	101	86	95	99	98	115	99	104	99	79
2009	107	64*	83	70*	55*	86	142	112	127	56*
2010	102	146	140	105	115	110	91	107	119	153
2011	108	61*	76	80	90	79	55*	92	114	66*
2012	118	61*	97	104	122	92	82	116	104	65*
2013	78	84	96	73	94	71	61*	67*	88	70*

However, the distribution of additional meteorological parameters are taken into account. During last 25 years, **meteorological water balance** (and connected water stress during deficit periods using water balance model IRRFIB) are used to assess drought impacts on plants. Surface water balance during vegetation period or different time scales (example for summer) is still main source of information for drought aftermath analysis and can be reproduced for periods since 1961. Daily data for the period 1961-2014 are freely available on-line on the web page of Slovenian Environment Agency: http://meteo.arso.gov.si/met/sl/agromet/data/, including long-term average of water balance for the period 1971-2000: http://meteo.arso.gov.si/met/sl/agromet/period/wb/ for chosen set of meteorological stations. Percentile statistics is used for historical drought classification.

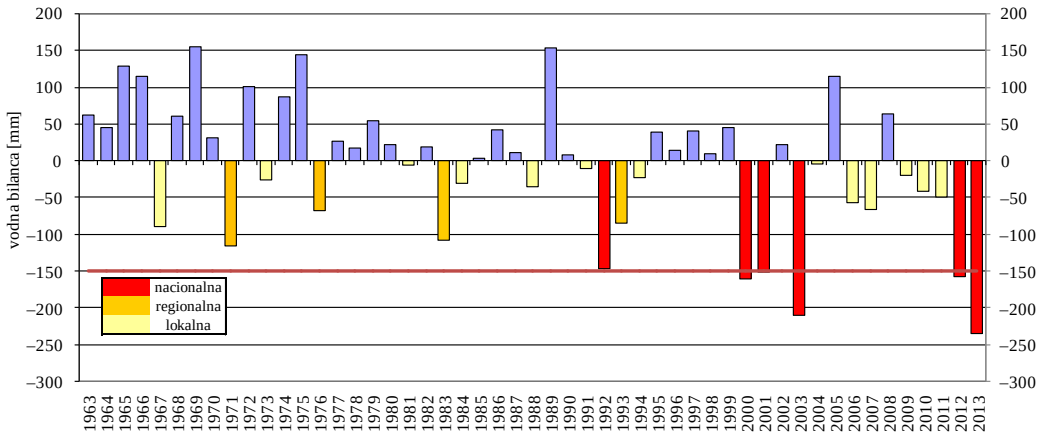


Example 3: **Daily** (upper figure) and **cumulative** (bottom figure) **meteorological water balance** for selected meteorological station (Murska Sobota). Evaluation of given year (2013) is performed with help of percentiles, calculated from data for the 1961-2013 period (Source: SEA, 2015).

Standardized precipitation index was implemented in 2009, also due to WMO recommendations („Lincoln" declaration on drought indices).
It is calculated for accumulation periods between 1 and 6 months. It is available on web in form of tables of SPI values, spatially interpolated to cadastral municipalities in order to facilitate queries for values relevant for certain locations.
Data is available on http://meteo.arso.gov.si/met/sl/agromet/indeks_spi/
Example of map with SPI values on cadastral municipalities is presented in Figure 4. Archive of maps of SPI3 and SPI4 for the record 2000-2013 are available on-line:
http://meteo.arso.gov.si/uploads/probase/www/agromet/product/form/sl/SPI_karte.pdf

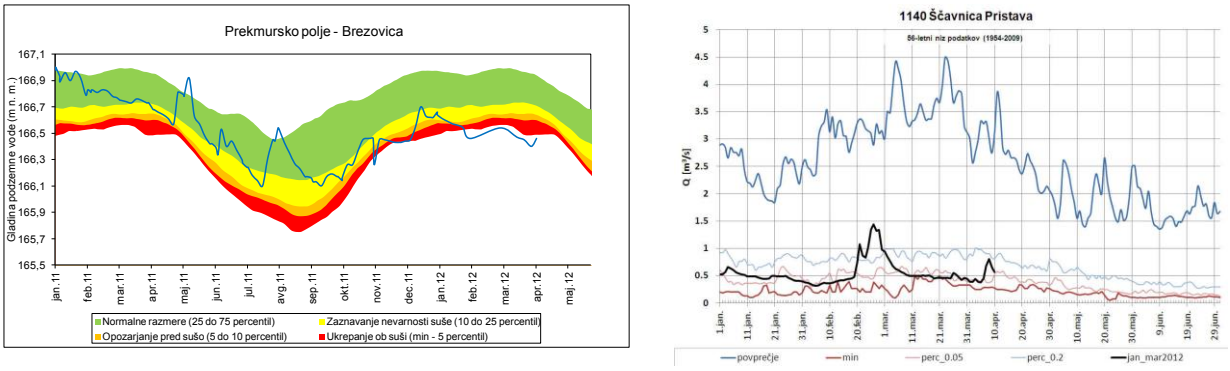


Example 4: Maps of **standardized precipitation index for 4-month period** in the vegetation period of maize and grass (SPI4 calculated on September 1) in the years from 2003 and 2012 for cadastral municipalities (Source: SEA, 2015).



Example 5: Average cumulative summer meteorological water balance (mm) in the period 1963–2013 (red line represents 75th percentile – dry) for 10 meteorological stations in Slovenia. Drought extent is classified as: national drought (more than 5 locations), regional drought (3 or 4 locations) and local drought (1 or 2 locations) (Sušnik, 2014).

Recently **Decadal index of drought stress (DISS)** was developed specifically to monitor agricultural drought stress for major crops in Slovenia (it includes soil water holding capacity characteristics and crop phenological phases). It is available for specific crops. It has been verified for major droughts in past 20 years (Sušnik, 2014). It is available on internal web page of SEA on request. Hydrological drought is monitored traditionally with comparison of river discharges and ground water levels to historical percentile classes.



Example 6: Hydrological drought in 2012. Groundwater level (left) and river discharge (right) for two locations in Pomurje region.

Annex II: Examples of the national drought indicator systems

Country: SLOVENIA

Parameter/indicators included or proposed into the national drought indicator system:

Existing national drought indicators:

Decadal (10-day) soil water balance bulletin (issued by SEA during vegetation period from April to October). Available on: http://meteo.arso.gov.si/met/sl/agromet/recent/wb/currentyear/.
It consists of the following indicators:

- ten-day totals and comparison to long-term average (temperature, precipitation and sunshine radiation, water balance, evapotranspiration);
- standardized participation index (SPI) for 1,3,6 months;
- soil water content;
- water availability of plants, phenological development and impact of weather (drought) on plants;
- outlook for five days.

Recently, DISS was introduced in more detailed agricultural drought evaluation (see Annex I).
In case of drought situation, additional **Hydrometeorological bulletin** is issued every 2 weeks with summary of all available relevant information on meteorological, agricultural and hydrological drought situation. All information is available in bulletins and on SEA web page (readily updated).

For hydrological drought (both river discharges and groundwater level), 5th percentile is considered as alarm level. See Fig. 6 in Annex I for example. For groundwater level, 10th percentile is considered as warning level and 25th percentile is denoted as threshold for dry conditions.

Proposed:
Remote sensing measurements of vegetation stress are planned to be used more extensively for drought monitoring. Their advantage is that they represent independent data source (not directly related to weather data from which majority of drought indicators are calculated).
Satellite derived Leaf area index (LAI) and fraction of green vegetation cover (FVC) are already available for meteorological satellites (poor spatial resolution).
We plan to upgrade information with implementation of new data sources (mainly using data from Copernicus LAND programme).

Additional relevant data source (directly related to agricultural drought) is also soil moisture measurement network. Currently, only few locations are equipped with soil moisture sensors, more locations of soil moisture measurements are desired.

Another proposal for improvement of monitoring is application of interactive web-based application for farmers (calculation of specific water stress according to local weather conditions, crop type and soil properties).

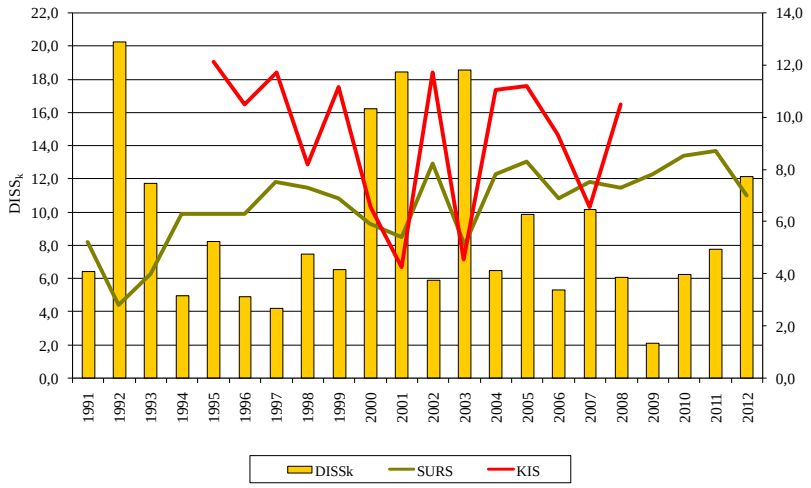
Methodologies used for evaluation of the chosen parameters/indicators:

- **AJDA database**, maintained by Administration of the Republic of Slovenia for Civil Protection and Disaster Relief (body of the Ministry of Defence): Damage assessment on agricultural products.

Municipalities process damage reports provided by the affected parties on specific forms. Damage calculations are based on approved evaluations. It allows various types of extracts at municipal, regional and national levels.

- **Statistical database,** maintained by Statistical Office (SURS): National crop yield statistics. http://www.stat.si/drz_stat.asp
- **Experimental yield data**, maintained by Slovenian Agricultural Institute (KIS)
- **Soil moisture measurements,** maintained by SEA

Drought indicators are compared with different sources data (less reliable evaluation – yield data depends on numerous factors besides drought induced water stress).



Example 1: Mean grain maize yield (variety Furio) from field experiments in Murska Sobota (adopted by Ceglar, 2011) in the period 1995–2008 and maize grain hybrid (variety C1200) in the period 1991–2012 in Slovenia (Pridelava poljščin ..., 2013), expressed in tons per hectare and cumulative drought stress index ($DISS_k$) for maize from 3rd of April to 1st decade of October on the soils with low water holding capacity in Murska Sobota in the period 1992–2012 (Source: Sušnik, 2014).

- **Secondary independent source** – satellite measurements (correlation between weather-based indicators and vegetation stress measurements).
- Another method is comparison of indicators calculated from different data sources (eg. Comparison of weather data based indicators to satellite-based vegetation stress measurements).

Evaluation is not performed systematically, rather as part of research and development projects and tasks.

Annex III: Examples of the national drought classification and early warning systems

Country: SLOVENIA

Indicators included into drought warning system

See Annex II.

Thresholds for chosen indicators for four drought stages (normal, pre-alert, alert, emergency):
Early warning thresholds: Three-level concept of agricultural drought monitoring

Level	Activity	Description	Indicators
Level 1	Early drought warning	Precipitation deficit (meteorological drought)	SPI3 < –1, Share of cumulative precipitation in the vegetation period (% of long-term average)
Level 2	First signs of agricultural drought	Meteorological water balance (reference crop)	Meteorological water balance below statistical threshold (percentile analysis): - 75th percentile – dry - 90th percentile – very dry - 98th percentile – extremely dry
Level 3	Agricultural drought	Agricultural crop drought stress (water balance for specific crop)	$DISS_k$ for selected crop: - 75th percentile – dry - 90th percentile – very dry - 98th percentile – extremely dry

Accumulations are performed during vegetation period and start on 1st April.

Middle-range outlook is added to monitoring information (up to 10 days ahead). Longer range forecasts (monthly, seasonal) are not implemented due to their accuracy issues.

Additionally, calculation of SPI for 1,3,4,6 for all cadastral municipalities in order to facilitate determination of geographical location of indicator thresholds are performed. SPI thresholds are currently twofold:

- generally accepted understanding of SPI drought levels (value of -1 defined as onset of moderate drought).
- Specific levels for SPI3 and SPI4 are used for assessment of selected insurance products. SPI3 from March to May (spring crops) and SPI4 for summer months (summer crops) (eg. for **insurance policy**) are published on the web page http://meteo.arso.gov.si/met/sl/agromet/indeks_spi/.

Hydrological drought: percentile classes for river discharges and groundwater levels (5th, 10th and 25th percentile are used for emergency, alert and pre-alert levels).

Answer on questions:
1. Is monitoring system sufficient for running of early warning system or requires upgrading ?
It is sufficient for general information, however according to advanced users (farmers, water management) it needs upgrading. Design of products to meet the specific needs for different decision makers is still needed. There is still need for a rigorous drought monitoring system to ensure that data and products are shared freely between institutions and agencies in a timely manner.

2. Are there technical means available for timely dissemination of warnings?
Information are mainly available through internet, radio, newspapers, magazines, journals, bulletins, TV, but there is still need to use the most cost effective and modern methods for information delivery (mobile phones, social media). More emphasis should be on more frequent training of the user communities to use decision support warning system.

3. How often should be actual data updated – daily or weekly?
Daily updates are generally not needed, weekly or decadal (10 day) are sufficient.

Annex IV: Examples of national organizational structures to deal with drought

Country: SLOVENIA

Competent authority:
Slovenian Environment Agency is responsible for meteorological and hydrological monitoring and early warnings.

Pre-alert, during drought:
In the period of drought development there are frequently organised press conferences and news in different media by Ministry of Agriculture, Forestry and Food and SEA.

After drought relief:
In past few years, ad-hoc working groups were organised on request of Administration of the Republic of Slovenia for Civil Protection and Disaster Relief after drought (drought relief).

In 2012 Slovenian **Drought committee** was established consisting of members from Ministry of Agriculture, Forestry and Food, Ministry of the Environment and Spatial Planning, Administration of the Republic of Slovenia for Civil Protection and Disaster Relief, Slovenian Environment Agency. The body is not operational at the moment due to governmental change.

Proposed composition of Drought Committee indicating involvement of all actors on three levels:

- *governing level*
- *professional level*
- *affected stakeholders*

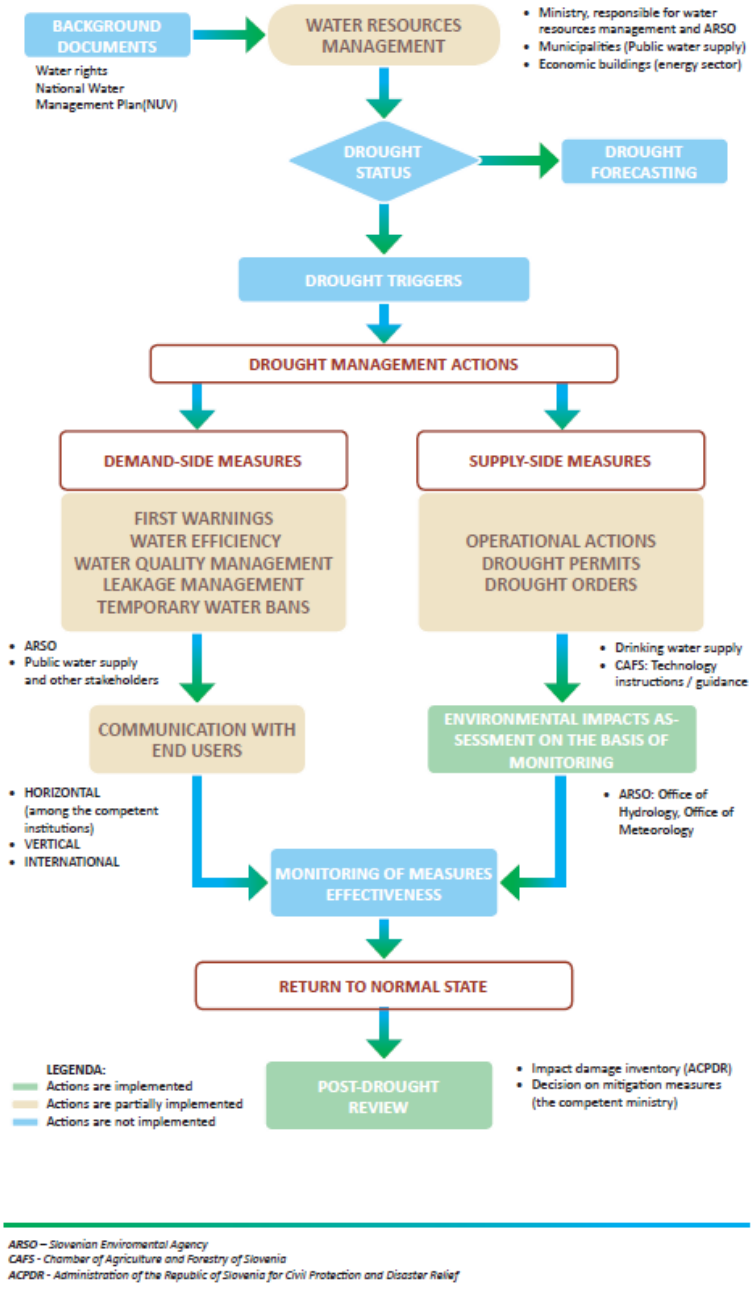
Schema of organizational structure for drought management is recommended:

Annex V: Examples of national program of measures for preventing and mitigating drought

Country: SLOVENIA

List of the measures identified on the base of the national situation in drought management structured at least into three groups:

- *organizational*
- *operational*
- *preventive*



Operational measures

Agriculture

Technical measures (Ministry of Agriculture, Forestry and Food, Agricultural Advisory service).

Water

Technical optimisation of water resources, water laws and rules for specific circumstances, environmental flows, drinking water supply (Slovenian Environment agency, Ministry of the Environment and Spatial Planning, Administration of the Republic of Slovenia for Civil Protection and Disaster Relief).

Organisational measures

In Slovenia there is organizational legal framework only for drought relief (Zakon o varstvu pred naravnimi in drugimi nesrečami (Uradni list RS, št. 64/94 in 28/06), Zakon o odpravi posledic naravnih nesreč (Uradni list RS, št. 75/03, 90/07 in 102/07), Uredba o metodologiji za ocenjevanje škode (Uradni list RS, št. 67/03, 79/04 in 81/06).

Preventive measures are mainly focused on the agricultural sector.

First measure is recommendation campaign of agricultural advisory service regarding technical measures and farming practices during dry conditions. Second measure is under development and foresees classification of agricultural lands in classes regarding suitability to cultivate water-demanding crops (taking into account soil and climate properties). Farmers will be strongly advised not to cultivate eg. maize on risky plots.

The example how to develop program of measures is provided in Annex V of the Guidelines (Slovak proposal)

Annex VI: Examples of the national research programme supporting drought management

Country: Slovenia

List of suggested actions for the national research program supporting drought management (eventually supplemented by short description of the action):

Agricultural drought
Applicative research projects available on web page:
http://www.mkgp.gov.si/si/delovna_podrocja/kmetijstvo/podnebne_spremembe_v_kmetijstvu/rezultati_javnih_narocil_iz_akcijskega_nacrta_2011/
National drought management plan for agricultural drought management (2013)