International Commission for the Hydrology of the Rhine Basin (CHR)

Annual CHR report 2012

Editorial office: Eric Sprokkereef – Rijkswaterstaat, VWM, Lelystad

Authors: Stephan Bader - MeteoSwiss, Zurich
Jörg Uwe Belz - German Federal Institute of Hydrology, Koblenz
Adrian Jakob - Federal Office for the Environment, Bern
Clemens Mathis - Amt der Vorarlberger Landesregierung, Bregenz
Silvia Morf-Graf - Federal Office for the Environment, Bern
Michael Mürlebach - German Federal Institute of Hydrology, Koblenz
Marc Schürch - Federal Office for the Environment, Bern

CHR Secretariat
P.O. Box 17
8200 AA Lelystad
Netherlands
Email: info@chr-khr.org
Website: www.chr-khr.org

The International Commission for the Hydrology of the Rhine Basin

The International Commision for the Hydrology of the Rhine Basin (CHR) acts as part of the International Hydrological Programme (IHP) of the UNESCO and the Hydrology and Water Resources Programme (HWRP) of WMO. It is a permanent, independent, international commission and has the status of a foundation registered in the Netherlands. Commission members are the following scientific and operational hydrological institutions of the Rhine basin:

- Federal Ministry of Agriculture, Forestry, Environment and Water Management, Department VII/3 - Water Management (hydrographic central office), Vienna, Austria,
- Amt der Vorarlberger Landesregierung, Department VIId – Water Management, Bregenz, Austria,
- Federal Office for the Environment, Berne, Switzerland,
- IRSTEA, Antony, France
- German Federal Institute of Hydrology, Koblenz, German,
- Hesse State Office for Environment and Geology, Wiesbaden, Germany,
- IHP/HWRP office, German Federal Institute of Hydrology, Koblenz, Germany
- Administration de la Gestion de l'Eau, Luxemburg
- Deltares, Delft, Netherlands
- Rijkswaterstaat – Traffic and Water Management, Lelystad, Netherlands.

1. Hydrological overview for the Rhine basin

Metereological characteristics

Austria

2012 was the seventh warmest year in Austria since 1768 with a deviation from the annual average of plus 1.1°C. Thus, 2012 confirms the trend of the past decades of increasing temperatures. The largest contribution to this result came from March, June, August and November, which were warmer by 2.0 to 2.8°C compared to the monthly average of past years. Only February was considerably too cold. It was the coldest February since 1986 with a devation of minus 3.8°C. In the Austrian Rhine basin, the annual air temperature average was 0.5 to 1.0°C above the average of past years.

The total of annual precipitation was particularly high in the West and South. In the West (Vorarlberg, Northern Tyrol), precipitation amounted to 10 to 20 percent more than the average between 1971-2000. There was 20 to 50 percent more precipitation in East Tyrol, Kärnten, southern Salzburg and parts of Steiermark. Precipitation was not as high as this since 1916 for the entire area. The total of annual precipitation was between 102 and 117 % of the average over the past years in the Austrian Rhine basin. When looking at the individual months, the picture is different. Precipitation was above average in the months of January, June as well as August to December, there was considerably less rain between February and May and in June compared to the average of past years (Fig. 1).

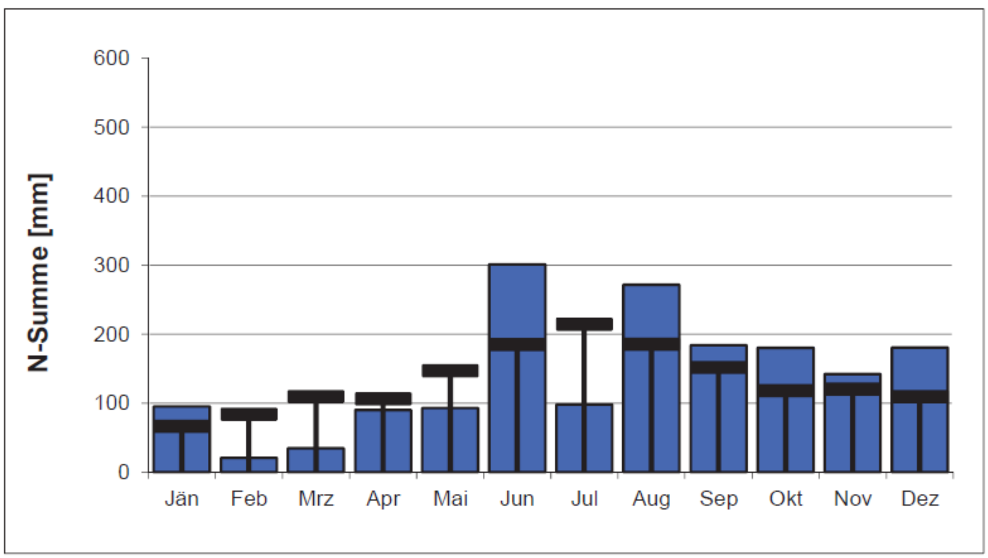

Figure 1: Total precipitation in 2012 compared to monthly averages of past years at the measuring point Bregenz Altreutheweg

After the previous year with considerable amounts of sunshine, the year 2012 had normal to slightly above-average amounts of sunshine. Compared to the average of the period 1991-2010, there was 9 percent more sunshine in all of Austria.

The large amount of precipitation in January in the West and the northern part of the main chain of the Alps and the notedly below-average temperatures in February resulted in above average amounts of snow in Vorarlberg, Tyrol and Salzburg. New snow amounted to 357 cm in January in Langen am Arlberg. The total amount of new snow correspond to approximately twice of the usual new snow in January.

Switzerland

The annual average temperature in Switzerland in 2012 was 1.3 degrees over the normal value of the period 1961-1990. The annual precipitation was 10 percent more compared to normal values. The year started winterly with above-average amounts of snow in the mountains and a considerable cold wave in February. Spring was extremely warm, very sunny and dry. In contrast, summer started slowly and a typical midsummer heat wave only came about in August. After the first signs of winter in early autumn with snow in the lower altitude, October brought a wonderful Indian summer in Switzerland immediately followed by snow in the lower altitude. The snow topic prevailed with a strong onset of winter at the end of November at the southern slopes of the Alps, in Wallis and Jura and with extensive amounts of snow in the lower altitudes in the entire country in the first half of December.

There were above-average amounts of snow in the Swiss Alps already at the end of the year 2011. A strong northwesterly stream in the first days of the year 2012 often brought with it even more snow in higher altitudes. In Andermatt in the central Alps, there was 2 m of snow, which is the third highest value for January since beginning of the recordings in 1966. In contrast, the conditions were mild and mostly free of snow in the lower altitudes. After a phase with sunny and mild winter weather, Switzerland experienced the most extreme cold wave in 27 years in the beginning of February. Cold air from Siberia caused a temperature drop to -9 to -10 degrees between 1st to 14th February in parts of east Switzerland. In western Switzerland, values were slightly higher and considerably higher in southern Switzerland with -2 to -8 degrees. The minimum values were below -20 degrees in lower altitudes north of the Alps and -30 degrees in Engadin at a high altitude. Snow fell occasionally north of the Alps during the cold wave so that there was continuous snow cover in the first part of February even at lower altitudes. However, this cover was mainly fairly thin. The second half of February was unusually mild south of the Alps. The unusual warmth covered the whole of Switzerland and continued into the first days in April. In the whole of the country, it was the second warmest March and even the warmest March south of the Alps since beginning of the records in 1864. North of the Alps, the sunshine duration reached record values in many regions while previous record values were reached in the Alps.

After record temperatures, the weather was unsettled and cool until the end of April. A foehn storm in the last April days brought summery conditions. A little later midsummer conditions were experienced. During continuous sunshine on 11th May temperatures reached 27 and 29 degrees and even over 30 degrees in individual places. This is very unusual in the beginning of May in German-speaking Switzerland. The zero-degree limit climbed to 4140 m above sea level. This is a levels, which has never been reached in the first half of May in the last 40 years. After a day with summery heat, Switzerland was gripped again by cold polar air. In heavy rain, the temperatures only reached little more than 10 degrees in lower altitudes. In mid-May, there was snow at 600 m above sea level. More heavy precipitation followed in the last third of May. The first part half of June was dull and wet in the entire country. Unsettled weather phases with repeated outbursts of cold air dominated the first three weeks in July.

Midsummer-like conditions lasted for only a short time in the last third of June and July were since beginning of, while summer-like conditions could be found during the whole of July in Tessin. Summer-like conditions lasting for a longer period of time in Switzerland were found in August. After the middle of the month, Switzerland even experienced a heat wave.

Temperatures above 30 degrees up to altitudes of 1500 m above sea level were recorded and some measurement points record values for August were
detected. A strong influence of polar air at the end of August and beginning of September ended the midsummer conditions in 2012. Large amounts of precipitation fell at the northern side of the Alps and some Alpine passes had to be closed because of fresh snow. After a phase of summer-like high-pressure weather, strong cold air brought snow down to lower altitudes from 11th to 12th September. In last September days, foehn weather was predominant with substantial relief rain at the southern side of the Alps.

After this wintery intermission, Switzerland experienced a wonderful Indian summer from 17th to 25th October. The temperatures climbed above 20°C even in some higher altitudes, which is unusually mild for this time of year. A considerable influence of polar air in the last October days covered large parts of Switzerland with snow. On 28th October, German-speaking Switzerland was under cover of fresh snow 1 to 10 cm thick, 10 to 20 cm in higher altitudes and even more in some areas.

From 12th November, longer-lasting high-pressure conditions with mild and sunny weather were prominent. Cold air coming from the north on 29th November brought some fresh snow on the northern side of the Alps. Along the foothills of the Alps, above 700 to 900 m above sea level the snow cover was up to 40 cm thick, while smaller amounts of fresh snow were detected in the Alps. The oncoming cold air brought the first day with temperatures below zero in many areas at the northern side of the Alps on the meteorological beginning of winter (01/12). The arrival of winter was emphasised further the next day when an active area of snowfall crossed the entire northern side of the Alps.

Table 1: Annual values of selected MeteoSchweiz measurement points compared to normal values

Station	**Altitude m above sea level**	**Temperature (°C)**			**Sunshine duration (h)**			**Precipitation (mm)**		
		Average	**Normal**	**Dev.**	**Sum**	**Normal**	**%**	**Sum**	**Normal**	**%**
Berne	553	9.3	7.9	1.4	1915	1638	117	1128	1028	110
Zurich	556	9.8	8.5	1.3	1779	1439	124	1292	1086	119
Genf	420	11.0	9.7	1.3	1938	1694	114	970	954	102
Basel	316	10.9	9.6	1.3	1721	1599	108	1048	778	135
Engelberg	1036	6.7	5.6	1.1	1427	1355	105	1634	1510	108
Sion	482	11.0	9.2	1.8	2212	2029	109	615	598	103
Lugano	273	13.3	11.6	1.7	2180	2026	108	1412	1545	91
Samedan	1709	2.4	1.3	1.1	1863	1732	108	699	700	100

Normal = Average over past years 1961-1990
Dev. = Deviation from normal values
% = Percdentage of normal values (Normal = 100%)

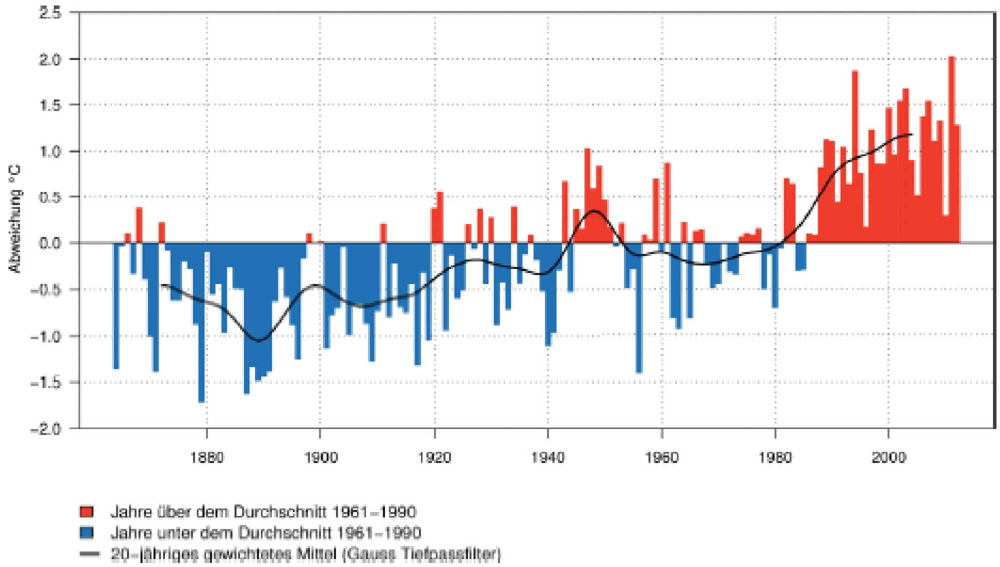

Figure 2: **Temperature deviations in Switzerland from the average of past years (reference period 1961-1990). Years with too high temperatures are indicated in red, years with too low temperatures in blue. Solid line: 20-year weighted average**

Germany

Nationwide, the temperatures in the water year 2012 (November 2010 - October 2011) were again (as in previous years) warmer than the average of past years by 1.0 °K with average temperatures of 9.2 °C Clear monthly deviations from the monthly average values used for comparison were noted in December 2011 and March 2012 with +3.1 and +3.4 °K, respectively, and in February 2012 with -2.9 °K.

Thus, December was the fifth mildest December and March even the third mildest March since 1881. The temperature average for February was considerably lower than the average of past years with -2.9° in Germany. This was the only month of this year that showed considerably lower values than the average of past years (see Fig. 3 and 4.1).

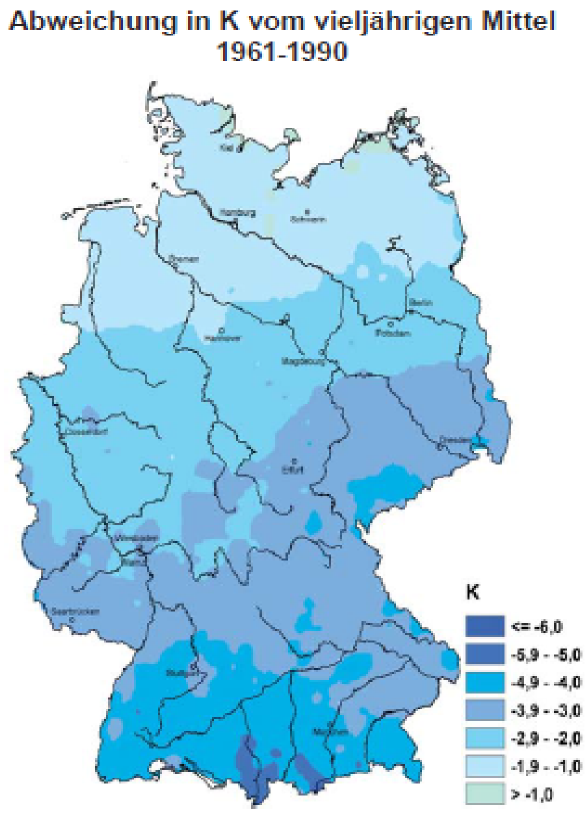

Figure 3: Temperature distribution in Germany in February 2012 (from: DWD WitterungsReport Express 02.2012)

As shown in Fig. 4.2 for the measurement point Cologne as example, the basic characteristics determined for entire Germany was also applicable for the Rhine area despite some deviations.

The average local precipitation in the Rhine basin in November were only 2% of the international, meteorological reference period 1961-1990 (driest November since 1881). While recording 193% and 156% if the average of the years 1961-1990 in December and January, respectively, the relative precipitation in February and March was significantly below the average of the reference period with 36% and 23%, respectively. For the remaining water year (April-October) the total precipitation was slightly under the average of past years with 92%.

As in previous years, the distribution of precipitation between winter and summer showed a higher percentage of summer precipitation with 44% to 56% compared to the reference period 1961-90 (winter 48.5%, summer 51.5%).

For comparison, the Figures 4.1 and 4.2 demonstrate the average values in Germany and for the Rhine area represented by the measurement point Cologne. The situation in the first five months of the reported year must be emphasised, during which the values recorded for the Rhine area exhibit larger deviations from the averages of past years compared to measurement values for entire Germany.

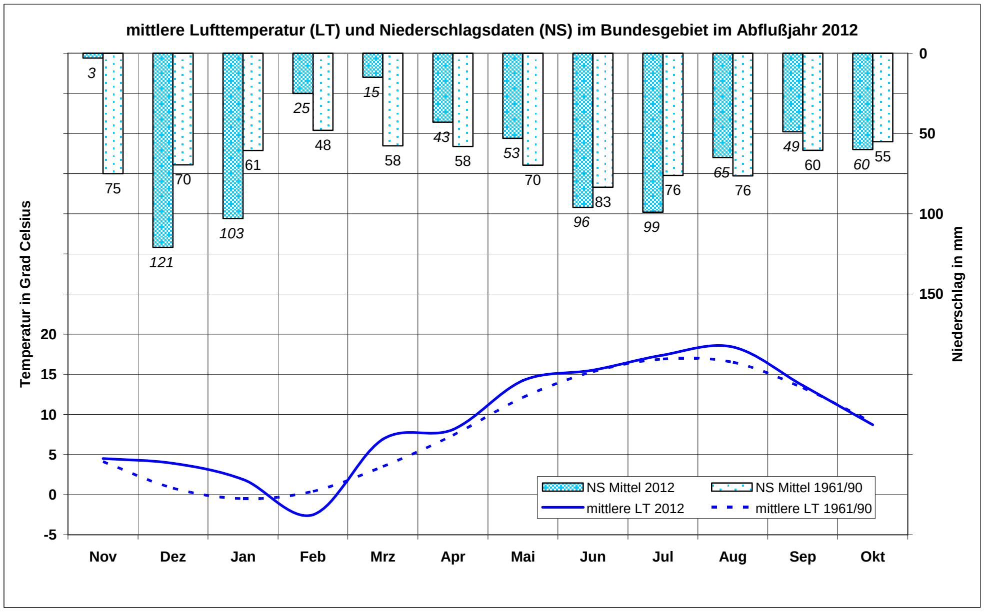

Figure 4.1: **Comparision of monthly temperature and precipitation data for Germany in the water year 2012 compared to the average of the years 1961-90 (source: DWD / monthly weather reports 2012)**

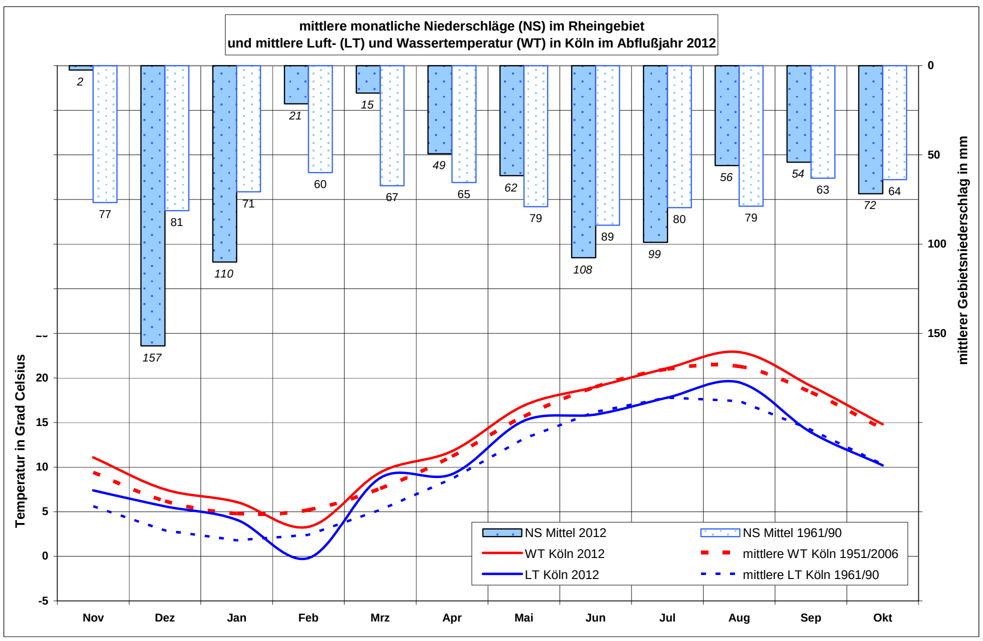

Figure 4.2: **Rhine basin/example station Cologne: Comparision of monthly temperature and precipitation data in the water year 2012 compared to the average of the years 1961-90 (sources: Temperature and precipitation- DWD, water level - WSV)**

Netherlands

The yearly average temperature at the measurement point De Bilt was 10.3°C and equalled the average of past years of 10.1°C almost exactly. The year 2012 started with mild temperatues in the Netherlands, but frost came at the end of January. The 33rd official cold wave since 1901 was experienced from 30th January to 8th February. A cold wave is a succession of at least five days with frost at the measurement point De Bilt (highest temperature below 0°C) with at least three days with strong frost (lowest temperature below -10°C). The lowest temperature in the Netherlands was measured on 4th February with -22.9°C at the measurement point Lelystad.

Spring was mild, which was mainly caused by the conditions in March. It was the third warmest March since 1901.

The average summer temperatures were normal, but the beginning of summer was unusually unsettled and cool. It was the coldest June in fifteen years and also July brought a long, wet, cool and dull period. Warm conditions in August compensated this. On 18th and 19th August, temperatures at the measurement point De Bilt reached over 30°C, which were the only two tropical days of the year 2012.

Temperatures in the three autumn months were within the range of the average of past years. Despite a cold beginning, December ended with mild temperatures.

With an average precipitation of 876 mm, 2012 was wetter than normal. The average of past years is 849 mm. 2012 started with large amounts of rain. Over five days, up to 80 mm were measured in the north in January. These relatively large amounts of precipitation fell on saturated ground due to the wet December and thus resulted in local flooding. March was notably dry with 19 mm compared to 68 mm. The year ended as it began with large amounts of precipitation. The average precipitation was 129 mm in December, which, together with the large amounts of precipitation in the neighbouring countries, resulted in high water levels.

With an average values of 1730 hours of sunshine compared to an average of 1643 of past years, 2012 was sunny above average. Extended sunshine during the cold winter weather in February was noticeable. The first ten days of this month were the sunniest first days in February since 1901.

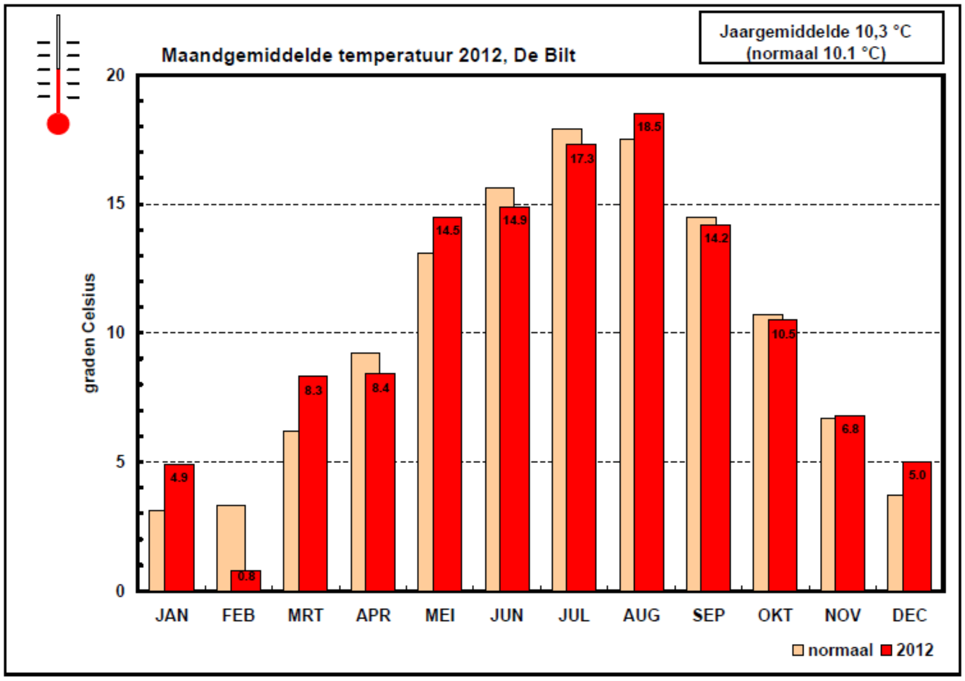

Figure 5: Monthly temperature average values at the measurement point De Bilt / Netherlands in 2012 compared to the average of past years (source: KNMI).

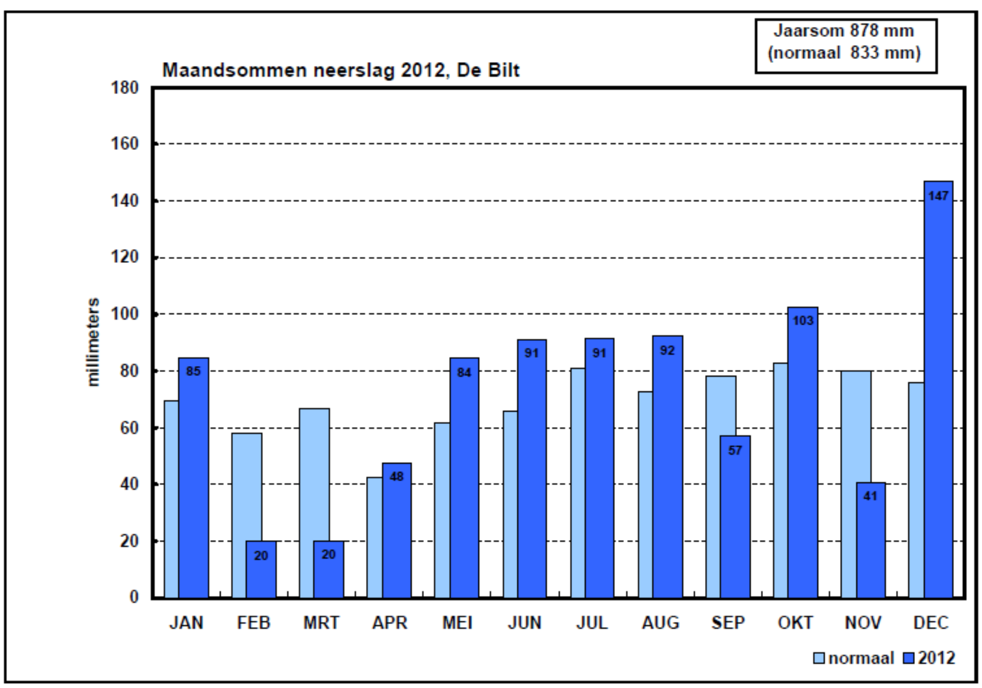

Figure 6: Monthly total temperature values at the measurement point De Bilt / Netherlands in 2012 compared to the average of past years (source: KNMI).

Hydrological situation in the Rhine basin in 2011

Water levels of the large lakes in the Rhine basin

The water level of Lake Constance at the gauge in Bregenz was above the respective daily average values at the beginning of the year up until 18th April. Due to the below-average amounts of precipitation in February to May and in July, the water level was below average during periods in April, May and July. Above-average amounts of precipitation beginning in August resulted in water levels above the respective daily average values of the reference period 1864-2011 each day (see Fig. 7).

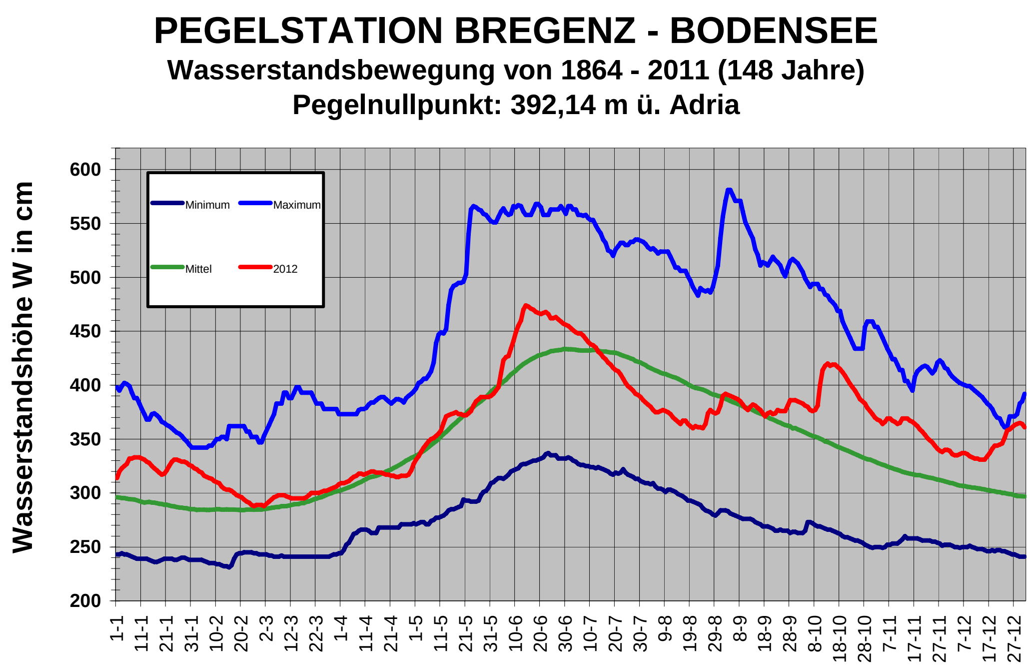

Figure 7: Gauge Bregenz/Lake Constance. Water level fluctuations of the year 2012 and average values of the period 1864 - 2011 (148 years) - gauge zero point: 392.14 m above Adriatic Sea.

Water levels and discharge of flowing waters

Austria

Discharges of the most important feeder rivers to Lake Constance were above the average of past years in 2012.

- at Bregenzerach 114 % (average 2012 = 52.8 m³/s, average reference period = 46.4 m³/s);

- at Alpenrhein 119 % (average 2012 = 277 m³/s, average reference period = 232 m³/s);

Switzerland

The above-average yearly precipitation (surplus of approx. 10% for entire Switzerland) corresponds to the discharge values. Approximately 110% of the average yearly discharge were observed in the Rhine at Basel. The large Rhine feeder rivers Aare, Reuss and Limmat showed similar surplus values.

When looking at individual months, January, October and December are noted with discharges highly above average. Especially the rivers of northern Switzerland carried large amounts of water in October; Thur, Töss, Sihl and Limmat with more than 200% of the respective monthly average. In the entire Rhine area, discharge in August was low. In many places, the monthly average discharge was below 70% of the values of past years. In the western areas, values clearly below average were also measured in February.

During the course of the year, there were only three incidents of flooding reaching HQ2 at the Rhine in Basel. The peaks of the incidents on 12th July and 23rd December stayed marginally below HQ2, the peak of 10th October was clearly above. In some Rhine areas, discharges with a larger recurrence period were observed. However, significant incidences were not recorded in this year on the northern side of the Alps.

Lake Constance had three phases with an above-average water level. January to end of February, June to middle of July and middle of September to the end of the year. The water level followed the average of past years almost exactly between the beginning of March and beginning of June. The water level was comparably low from middle of July to end of August.

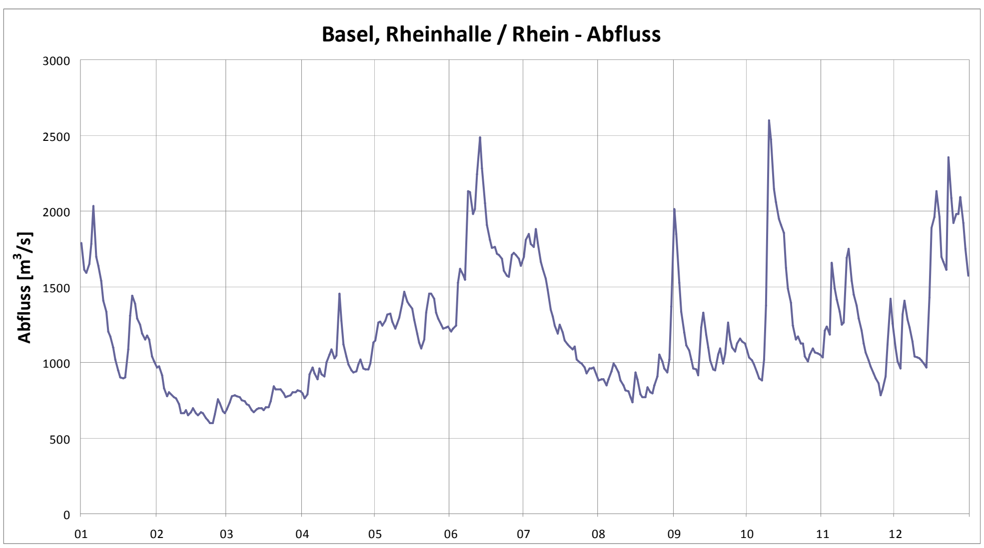

Figure 8: Flow graph at the gauge in Basel,Rheinhalle / Rhein in 2012 (preliminary data)

Germany

Discharges in the hydrological year 2012 (represented in the graphs of the Figures 4 to 14, table 2 shows important hydrographical values) were largely affected by the unusual meteorological activities mentioned above. Absence of precipitation in November resulted in discharge values considerably below average compared to values of past years of the gauges in the Rhine basin. The monthly discharge average was only approx. 50% of the monthly average of past years at the Rhine gauges; 46% were measured at the Main, 32% at the Neckar and only 23% at the Lahn. With 51 m³/s the Mosel river reached only 9% of the normal monthly discharge in November. Until the beginning of December, the monthly average values were constantly (and occasionally considerably) below the average values of the reference period.

The weather changed drastically in the first days in December. The dry November was followed by a period with large amounts of precipitation lasting for several weeks. This resulted in water levels and discharges largely above the average values at all gauges of the Rhine basin. The monthly discharge average was higher by approx. 114% in December, while the average values in January at Rhine, Main and Mosel reached up to approximately 170%, and 178% and 192% at Neckar and Lahn, respectively. Statistically, flow peaks with a recurrence period of 2 years were reached at all measurement points. As a result of unusually dry February and March, the average values of Rhine and its tributaries were clearly below the average values of the reference period already in March as observed in November. In the course of the remaining year, the discharge values at the Rhine gauges fluctuated around the yearly average value (reference period 1931-2011). Smaller flood peaks were detected only in July and October, which reached the peak observed in January in Maxau at Oberrhein. However, these values were considerably lower at other gauges at Kaub and Cologne.

Table 2: Hydrographical values (discharge) for selected gauges in the Rhine area

Gauge	MQ		NM7Q		HQ	
	2012	1931-2011	2012	1931-2011	2012	1931-2011
Maxau (Rhine)	1250	1250	498	628	2850	4440
Rockenau (Neckar) * 1951-2011	100	137*	33,9	43,6*	914	2690*
Raunheim (Main) * 1981-2011	180	224*	74,9	81,1*	536	2150*
Kaub (Rhine)	1600	1650	642	818	3970	7200
Cochem (Mosel)	258	313	46,2	68,9	2110	4170
Cologne (Rhine)	1950	2110	751	999	6330	10800

When considering the discharged amounts of water, it is noted that almost a quarter of the total yearly discharge flowed through during December and January (this is normally only approx. 17 %). For the tributaries included in the analysis the flow percentage is on average 25% over the reference periode for these two months. The respective total discharge was 40% at Main and Neckar as well as 50% at Mosel 55% at Lahn of the discharged volume during the hydrological year. At the Rhine, the discharge values were below the yearly average minimum discharge (MNQ) on during 25 days at the beginning of the hydrological year.

The monthly MNQ (mMNQ) were underrun especially during the winter months (Nov-Apr) at the beginning and end of the reported period, while the underrun days increased with an increased catchment (Maxau 46, Kaub 69 and Cologne 93 days). During the summer months, the mMNQ were underrun on average during 40 days mainly in August. At the gauges of the tributaries, the MNQ were underrun at the Main on only 2 days and not underrung at the Lahn. The mMNQ were clearly underrung during the winter months during 94 and 115 days compared to the summer months with 56 and 68 days. The situation was completely different at Neckar and Mosel. The MNQ were equally underrung during the winter and summer months with 28 and 17 days (Neckar) as well as 27 and 18 days (Mosel). Thus, the underrun mMNQ present a completely different picture. In contrast to all gauges considered above, the number of days underrun was clearly lower during the winter months than during the summer months. These were 93 and 114 days at the Neckar, and only 41 days during the winter and 75 days during the summer at the Mosel.

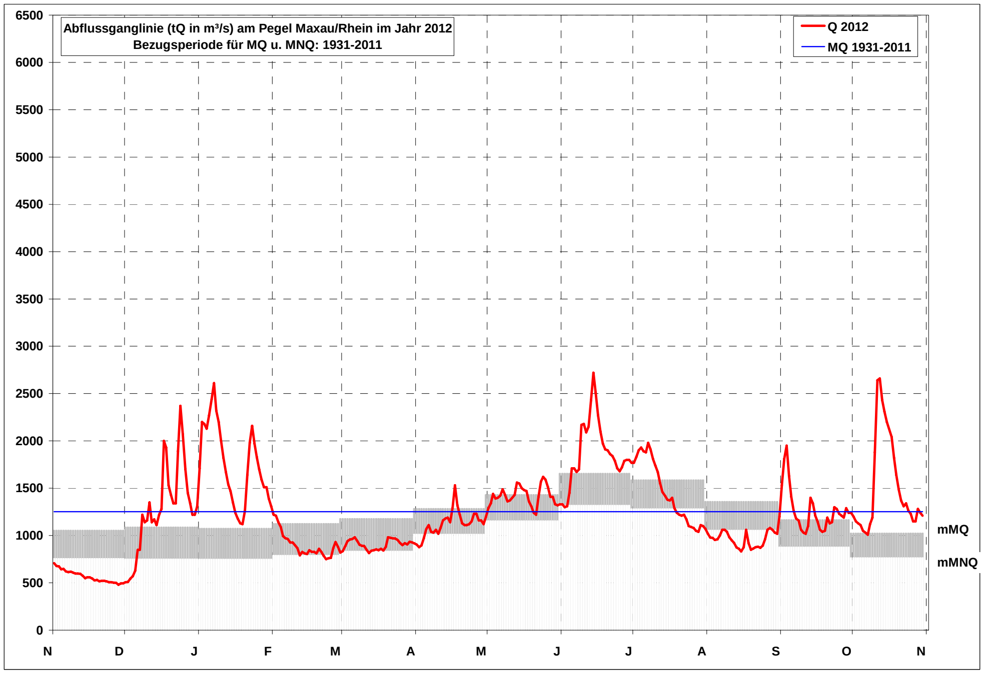

Figure 9: **Discharge graph (tQ) at gauge Maxau (Rhine) in 2012 in m³/s (reference period for MQ, mMQ and mMNQ: period 1931-2011)**

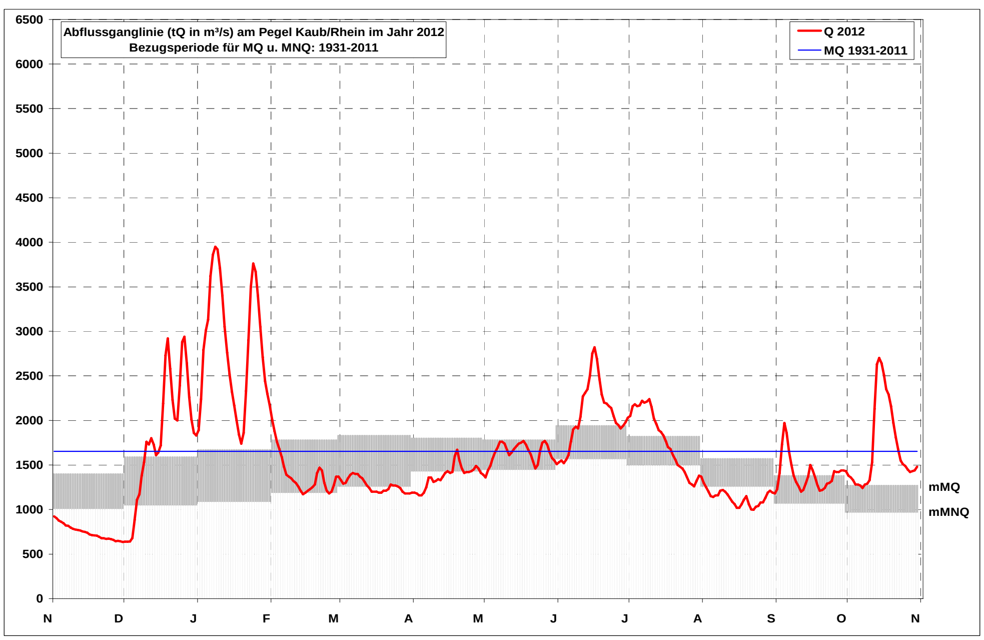

Figure 10: **Discharge graph (tQ) at gauge Kaub (Rhine) in 2012 in m³/s (reference period for MQ, mMQ and mMNQ: period 1931-2011)**

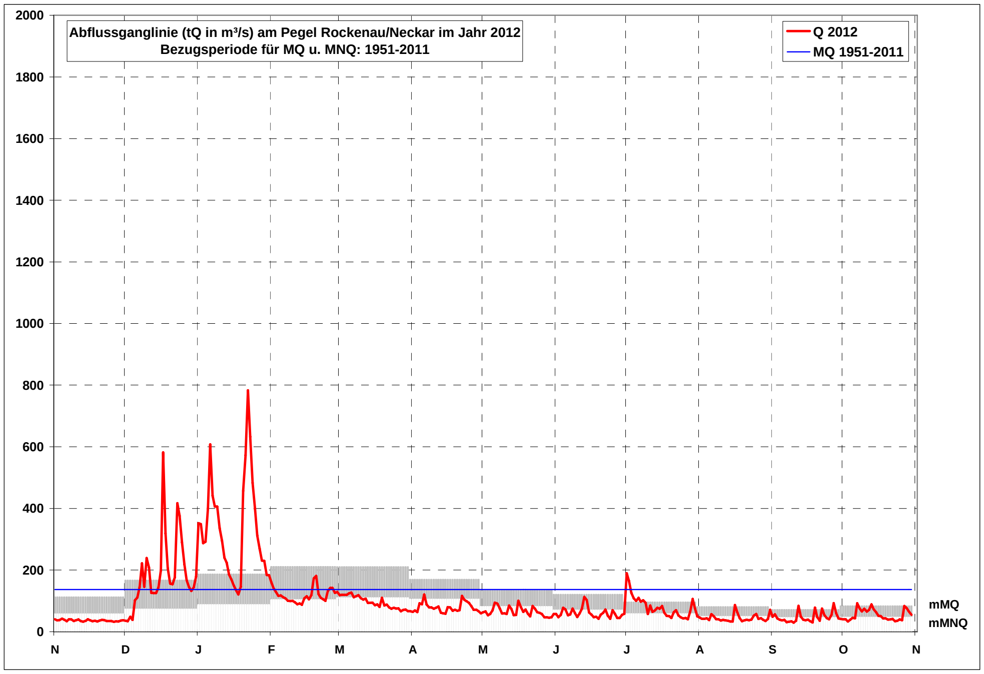

Figure 11: **Discharge graph (tQ) at gauge Rockenau (Neckar) in 2012 in m³/s (reference period for MQ, mMQ and mMNQ: period 1951-2011)**

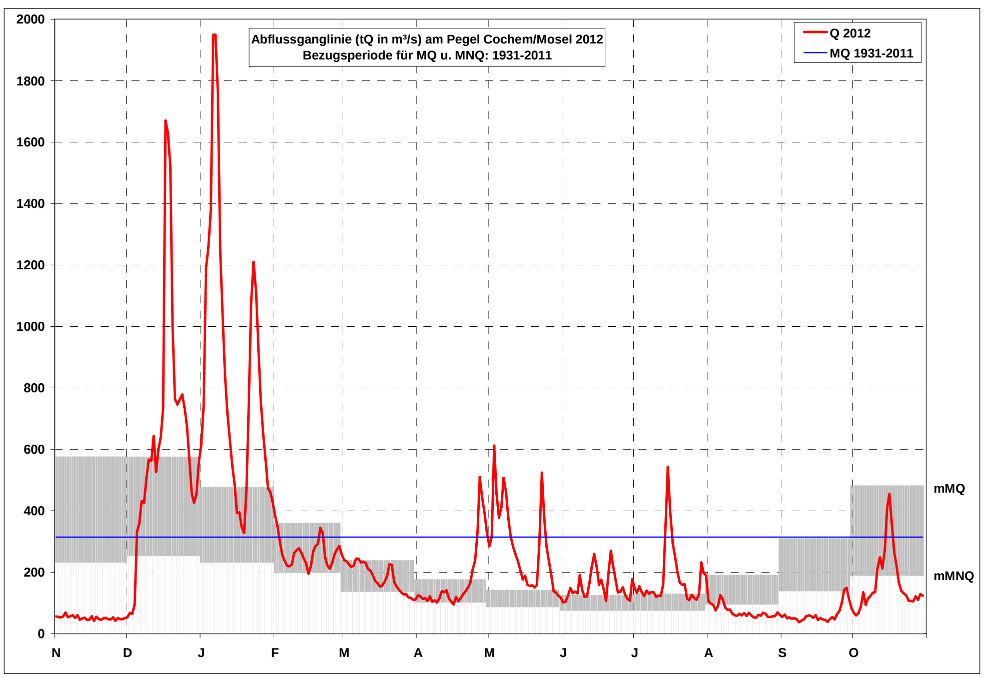

Figure 12: **Discharge graph (tQ) at gauge Raunheim (Main) in 2012 in m³/s (reference period for MQ, mMQ and mMNQ: period 1931-2011)**

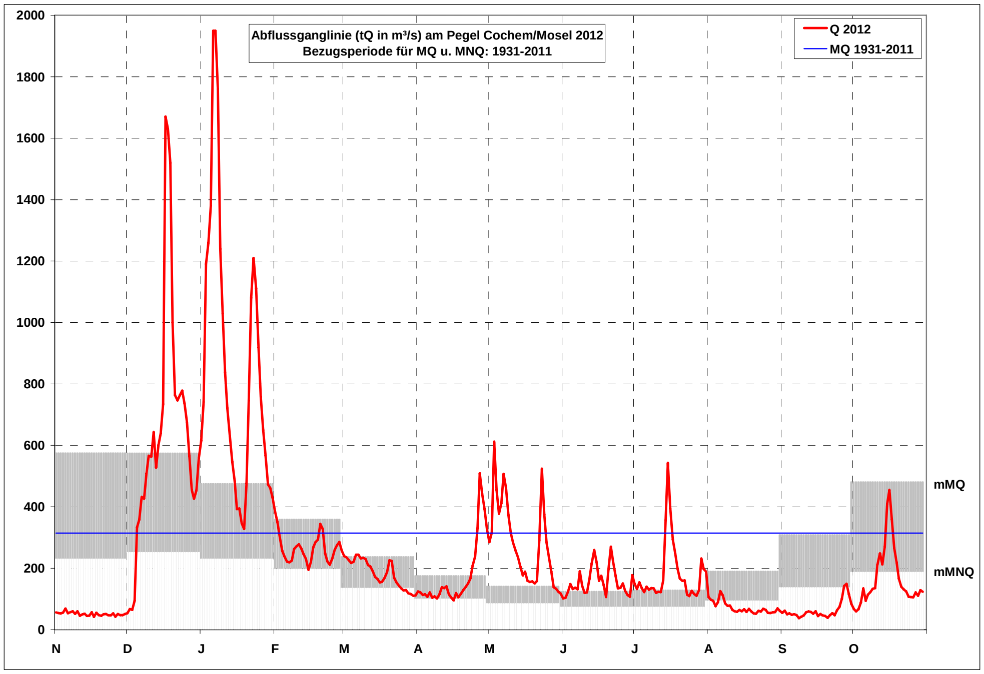

Figure 13: **Discharge graph (tQ) at gauge Cochem (Mosel) in 2012 in m³/s (reference period for MQ, mMQ and mMNQ: period 1931-2011)**

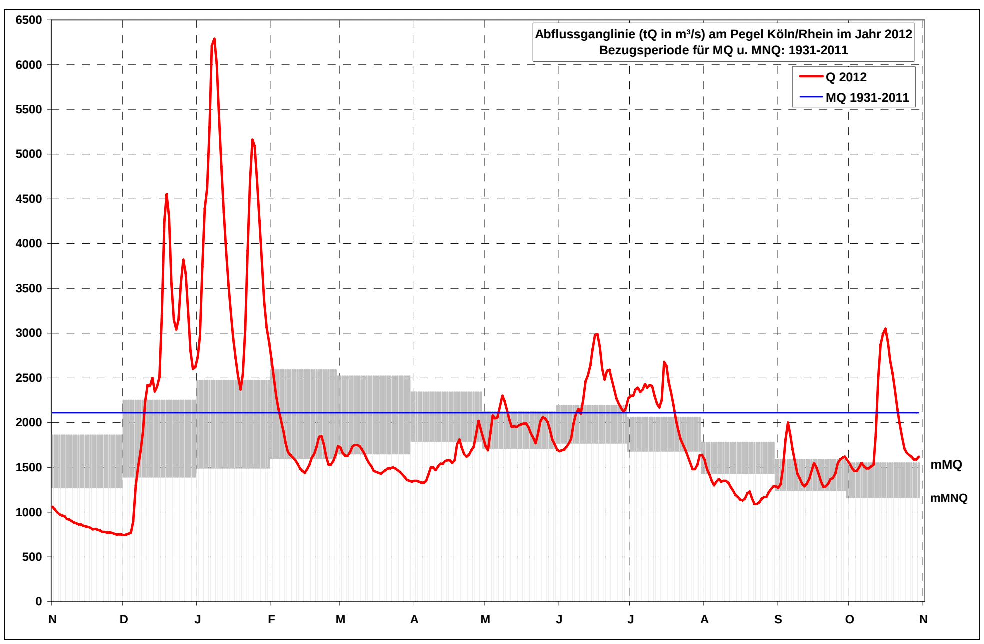

Figure 14: **Discharge graph (tQ) at gauge Cologne (Rhine) in 2012 in m³/s (reference period for MQ, mMQ and mMNQ: period 1931-2011)**

Water temperatures

The yearly average water temperature of Lake Constance was 12.6 °C at the gauge at the harbour Bregenz and was thus 0.5 °C over the average of past years of 11.8 °C.

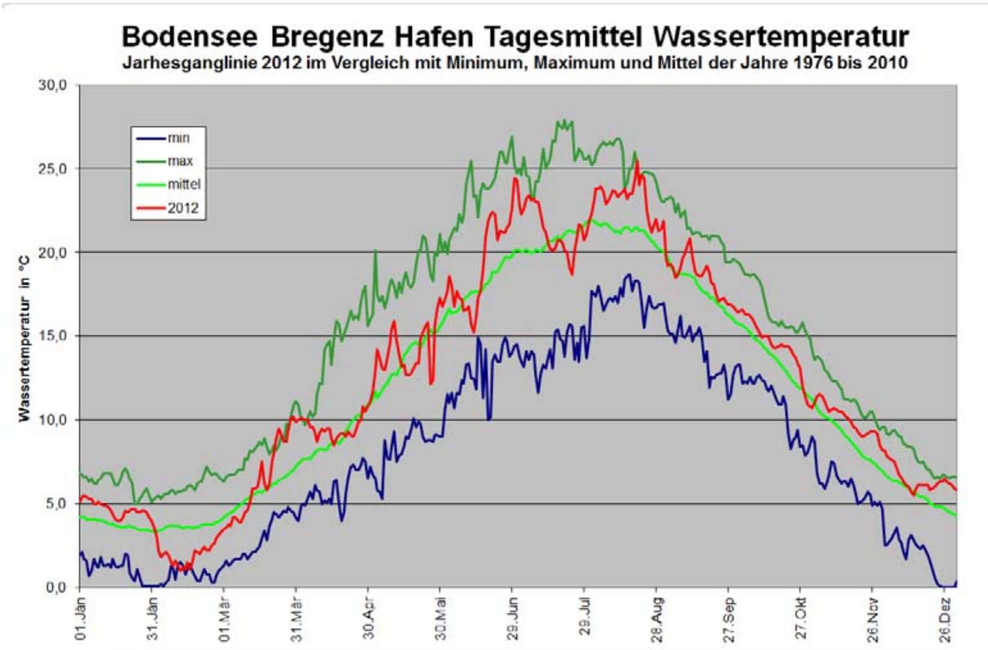

Figure 15: Yearly graph of the daily water temperature average 2012 at the gauge Bregenz Harbour / Lake Constance

The course of the daily measured water temperatures (WT) at selected measurement points showed different trends. From the beginning of the report period until February the WT in Cologne was on average 0.7 °K above the WT in Kaub, while it was 0.7 °K below these values for the period from May to August.

The yearly average values for the report period were 13.7°C at the gauge in Kaub and are 0.2 °K above the yearly average values of past years (1996-2010). The temperature at the gauge in Cologne was 0.4 °K below at 13.6 °C. The largest deviations were detected in February, at the gauge Kaub (on average 3.4 °K below the average of past years) and in Cologne (3 K below average).

It is noticable that the water temperatures in Cologne are below the temperatures in Kaub for the period between the last third of April until mid-September. However, higher water temperatures were measured generally in Cologne at the beginning and end of the report period. Investigations into the conditions of this phenomenon are under way.

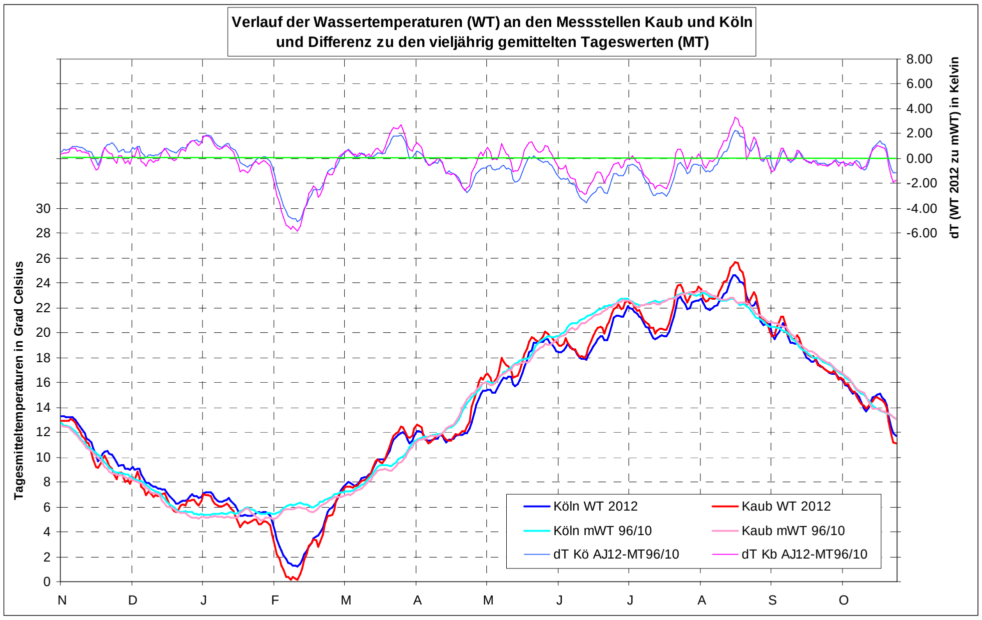

Figure 16: **Water temperatures compared to average values of past years.**

At the gauge Lobith, the average water temperature was 0.6°C above the yearly average of past years (1961-2012) at 13.6°C.

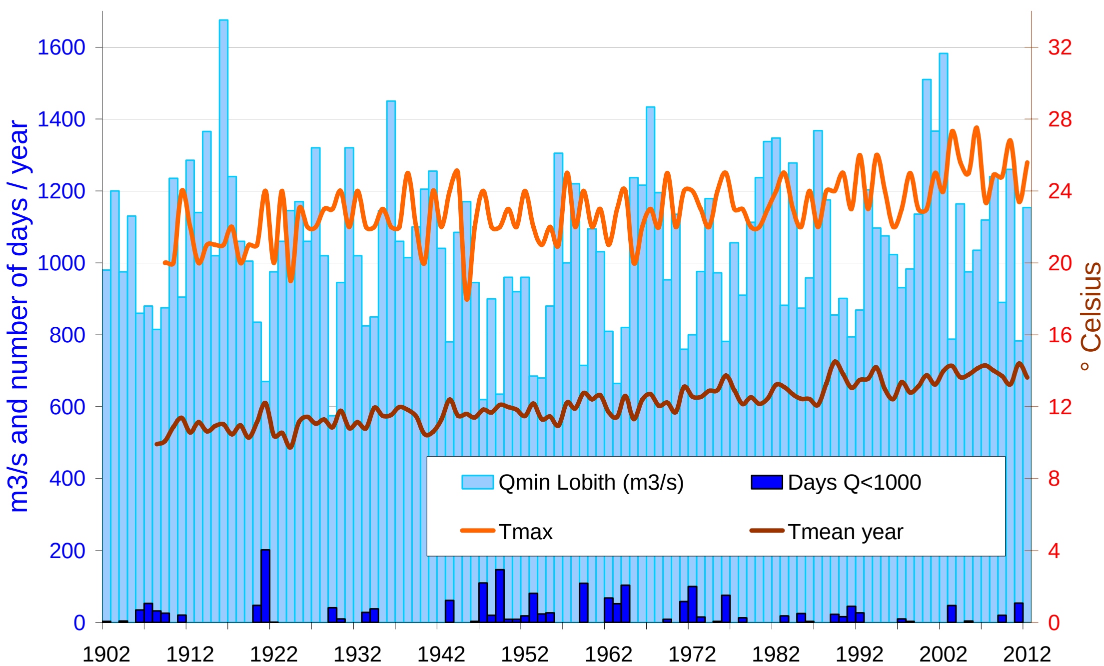

Figure 17: **Average and maximum water temperatures at the gauge Lobith/Rhine**

Ground water

The above-average amounts of precipitation resulted in above-average groundwater levels in the Austrian part of the Rhine catchment basin. As the water levels at some groundwater measurement points were below average, above-average values were only reached at the end of the year.

The nationwide low groundwater levels and spring flows of 2011 normalised in large parts at the beginning of 2012 due to above-average amounts of precipitation. Large amounts of precipitation in the second half of the year resulted in a further increase of groundwater levels and spring flows. Locally, new record values were reached in December, but not during the course of the year. At the end of the year, the groundwater levels in the Alps were within the normal range due to snowfall.

Development and characteristics of the particle concentrations in the German part of the Rhine area in 2011

To gain an overview of the particle loads, date of the measurement points Maxau (Oberrhein) and Weißenthurm (for the area below the large feeder rivers) were analysed, see also Fig. 18a and 18b.

Extreme maximum values for daily loads are result of heavy rainfall in summer and thawing in winter.

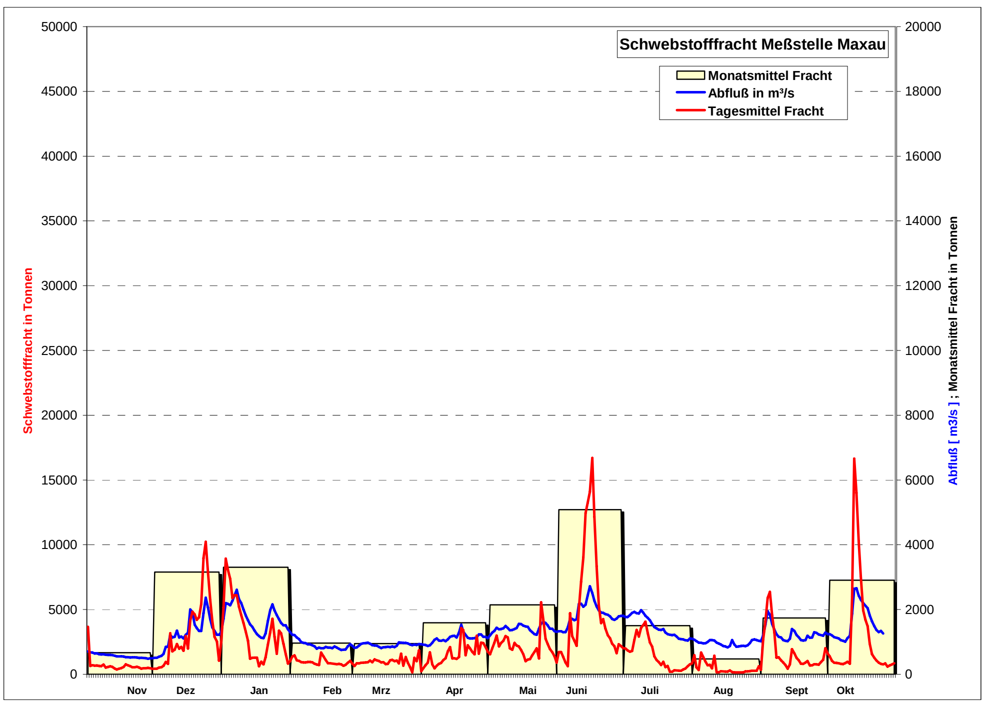

Figure 18a: Particle measurement point Maxau, Rhine-km 362.3

In Maxau (Rhine-km 362.3), the yearly particle load was 747615 t, which corresponds to approximately 59% of the yearly average in the reference period 1965-2007.

The highest monthly particle transport was measured at the measurement point Maxau in June 2012 with 152576 t, the lowest particle transport was only 20041 t in November 2011.

For the daily loads, the lowest daily load of 147 t was measured on 19th August with an average discharge of 851 m³/s and the highest daily load of 16699 t on 15th June with an average discharge of approximately 2500 m³/s.

The gauge Maxau at Rhine-km 362.3 was used as reference gauge to determine the discharge.

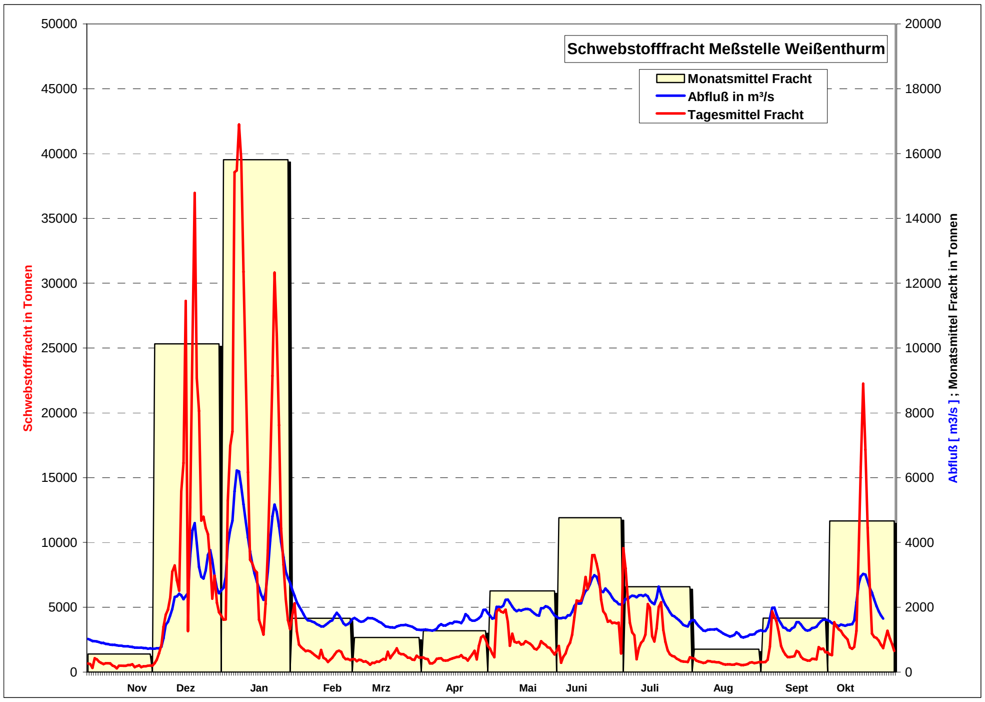

Figure 18b: Particle measurement point Weißenthurm, Rhine-km 608.2

In Weißenthurm (Rhine-km 608.2), the yearly particle load was 1457593 t, which corresponds to approximately 47 % of the yearly average in the reference period 1965-2007.

The highest monthly particle transport was measured at the gauge Weißenthurm in January 2012 at 314030 t with an average monthly discharge of 3930 m³/s, the lowest particle flow was only 24961 t in November 2011 (with MQ of 832 m³/s).

The lowest daily transport at the measurement point Weißenthurm was detected on 14th November 2011 with 287 t and an average discharge of 829 m³/s. In contrast, the largest daily transport was 42250 t on 8th January 2012 (with an average daily discharge of approximately 6200 m³/s.

The gauge Andernach at Rhine-km 613.8 was used as reference gauge to determine the discharge.

2. Activities of the International Commission for the Hydrology of the Rhine Basin (CHR) in 2012

The CHR had two meeting s in 2012; 14th and 15th June in Strasbourg (France) and 22nd and 23rd November in Leiden (Netherlands).

Changes within CHR

At the beginning of the 69th meeting in Strasbourg, presidency of the commission was handed over from Prof. Dr. Manfred Spreafico to Prof. D. Hans Moser. Mr. Spreafico left CHR after 22 years of service.
The representative from Luxemburg, Mrs. Christine Bastian, left the CHR. During the autumn meeting, Luxemburg was represented by Mr. Henri Hansen for the first time.

Activities in CHR projects

RheinBlick2050

During the 70th meeting of the CHR, the continuation of RheinBlick2050 was discussed. Project proposal was made by Mr. Görgen containing, amongst others, the following topics:

- Consistent regional climatic projections as input for hydrological models
- Water temperature
- Sediment transport
- Consideration of glaciers and lakes in the hydrological models
- Examination of high flows

The proposal was evaluated by the representatives as interesting but to broad. A new project should follow on from the activities of CIPR in the areas climatic change and water temperature. The discussion will be continued in 2013.

ASG-Rhein: Contribution of snow and glacier melting to Rhine flow

The project was assigned to a group of the University of Freiburg, University of Zurich and the engineering firm Hydron. The group was represented in the 69th meeting of the CHR by project leader Dr. Stahl from the University of Freiburg. Mrs. Stahl explained the plans of the group for the implementation of the project. The project started in September 2012 with a kick-off meeting. At the request from Switzerland, it was agreed to use the 1x1 km Larsim model for the hydrological modelling of the alpine catchment area. Since this model is property of LUBW Baden-Württemberg, the institute was invited to join the group.

Sediment

The report “Methods for the Estimation of Erosion, Sediment Transport and Deposition in Steep Mountain Catchments” was published in the green series of the CHR.
A new project with the title “From the source to the mouth” was elaborated by Mrs. Hillebrand of BfG in the 70th meeting of the CHR. In this project, a sediment balance is drawn for the entire Rhine catchment while distinguishing between the different sediment fractions. The CHR is involved in this project with a consultant group.

Future activities

Since the end of 2011, CHR has been discussing a new project proposal, which investigates the influence of socio-economical changes on the discharge conditions of the Rhine. The proposal was developed further by Deltares and presented in the 70th meeting. The CHR representatives doubt that the estimated budget will be sufficient for such a detailed study. It was agreed to organise a small colloquium for the preparation of the first phase of the project. This colloquium will be held in the beginning of 2014.

The regulating potential of Lake Constance especially during low water was mentioned as a potential future research topic.

WMO and CHR as well as ICPR and CHR further discussed an improvement of their collaboration.