

**WMO RAVI Working Group on Hydrology  
Subgroup on Flood Forecasting and warning  
Activity report 2005-2009  
Appendix 2 (The questionnaire)**

## 1. GENERAL

### Name, country and full contact details of the answering institution:

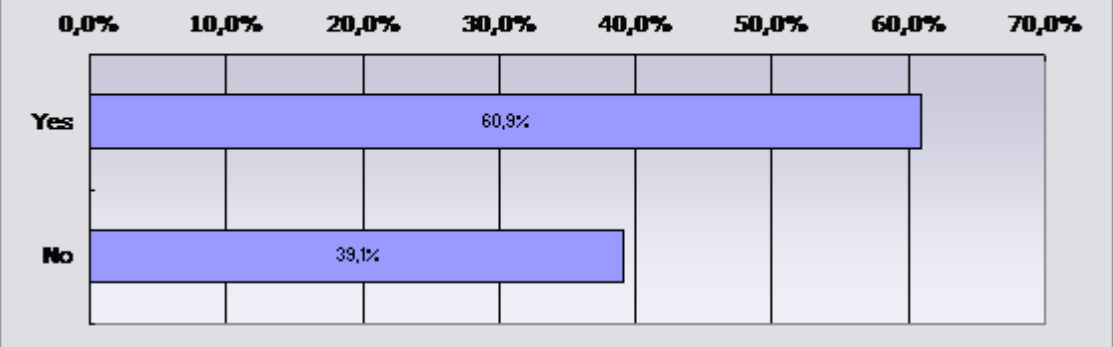
Email	First name	Last name	Info	Response
anc@ceh.ac.uk				United Kingdom
arfontal@mma.es				General Directorate of Water Agustin de Bethencourt, 25 28071 MADRID
armstate@meteo.am				Armenian State Hydrometeorological and Monitoring Service ARMENIA ZARA PETROSYAN (37410)536021 taronedit@yahoo.com, armstate@meteo.am
auguliene@meteo.lt				Lithuanian Hydrometeorological Service Rudnios str. 6 LT - 09300, Vilnius Lithuania Tel. (+370 5 ) 275 1194 Fax ( +370 5 ) 272 8874
bedr@mecom.ru				Sergey Borshch, the Russian Federation, the Hydrjmeteorological centre of Russia, 11-13, Bolshoy Predtechenskiy per., Moscow 123242 Russia
bogdan.ozga-zielinski@imgw.pl				Bogdan OZGA-ZIELINSKI Poland IMGW, ul.Podlesna 61 01-673 Warszawa
charles.galdies@maltairport.com				Meteorological Services MIA plc Malta tel: +356 23696527 charles.galdies@maltairport.com
cs@dmi.dk				Danmarks Meteorologiske Institut Lyngbyvej 100 DK-2100 København Ø
danelka@chmi.cz				Czech Hydrometeorological Institute, Na Sabatce 17, 14306 Praha, Czech Republic

daniela.kyselova@shmu.sk			Slovak Hydrometeorological Institute Jeseniova 17 833 15 Bratislava Slovakia
director@hnms.gr			Hellenic National Meteorological Service El. Venizelou, 14 Hellinikon GR 16777 Greece
gunlog.wennerberg@smhi.se			SMHI, Sweden Cristina Edlund Hydrological Forecasting cristina.edlund@smhi.se
hamza.ozguler@dsi.gov.tr			Hakan AKSU State Hydraulic Works of TURKEY 06100 Ankara
inita.stikute@meteo.lv			State agency Latvian Environment, geology and meteorology agency , Maskavas Street 165, Riga, LV-1019, Telephone: +371 7032 600, Fax: +371 7 145 154, E-mail: lvgma@lvgma.gov.lv
jaan.saar@emhi.ee			Estonian Meteorological and Hydrological Institute www.emhi.ee Toompuistee 24, Tallinn, Estonia
karl-heinz.daamen@lfu.bayern.de			Daamen, Karlheinz, Bayerisches Landesamt fuer Umwelt, lazarettstraße 67, 80636 Munich, Germany
lipins@ukrweather.kiev.ua			Ukraine
markku.puupponen@ymparisto.fi			Bertel Vehviläinen Finland Finnish Environment Institute Mechelininkatu 34 A P.O. Box 140 FI-00251 Helsinki
moj@nve.no			Sverre Husebye Head of Water Balance Section Hydrology Department Norwegian Water Resources and Energy Directorate (NVE) e-mail: shu@nve.no Tel.: +4722959148/+4722959595 Adr.: NVE; PoBox 5091 Majorstua N-0301 Oslo Norway
petre.stanciu@hidro.ro			Petre STANCIU, National Institute of Hydrology and Water Management, Bucharest ROMANIA Sos.Bucuresti-Ploiesti ,Nr.97 Sector 1,013686 ,Tele.0040213179992 Fax.0040213181116 E-mail stanciu@hidro.ro

piet.warmerdam@wur.nl			Rijkswaterstaat Centre for Water Management Eric Sprokkereef PO BOX 17 8200 AA Lelystad The Netherlands
ramazchitanava@rambler.ru			The Centre for Monitoring and Prognostication of the Ministry of Environment Protection and Natural Resources of Georgia (NMHS of Georgia)
reinhold.godina@lebensministerium.at			Reinhold Godina, Austria Department VII - Water / Subdepartment VII/3 - Water Balance in the Federal Ministry of Agriculture, Forestry, Environment and Water Management Marxergasse 2 A-1030 Vienna, Austria Tel.: +43-1-71100 6944 E-Mail: reinhold.godina@lebensministerium.at
t.petkovic@hidmet.sr.gov.yu			Serbia
teresa.abrantes@meteo.pt			IM - Meteorological Institute Rua C - Aeroporto de Lisboa 1749-077 Lisboa Portugal Tel:(351)218447000 Fax:(351)218402370
therese.buergi@bafu.admin.ch			Swiss Federal Office for the Environment Hydrology Department Section Analysis and Forecasts Therese Bürgi CH-3003 Bern - Ittigen

**2. GENERAL**

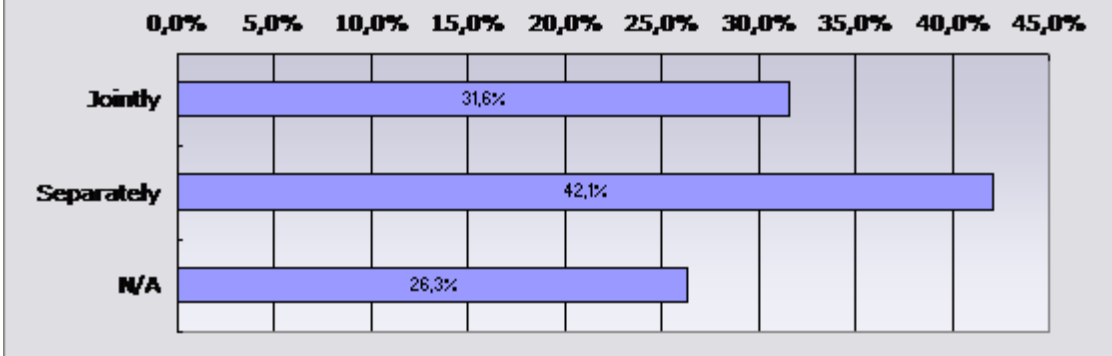
**Is your service a joint hydrometeorological service**



	Percentage	Count
Yes	60,9%	14
No	39,1%	9
Respondents		23
No response		3

**3. GENERAL**

**If your service is a joint hydrometeorological service, are the operational hydrological and meteorological forecastings done jointly or by a separate unit?**

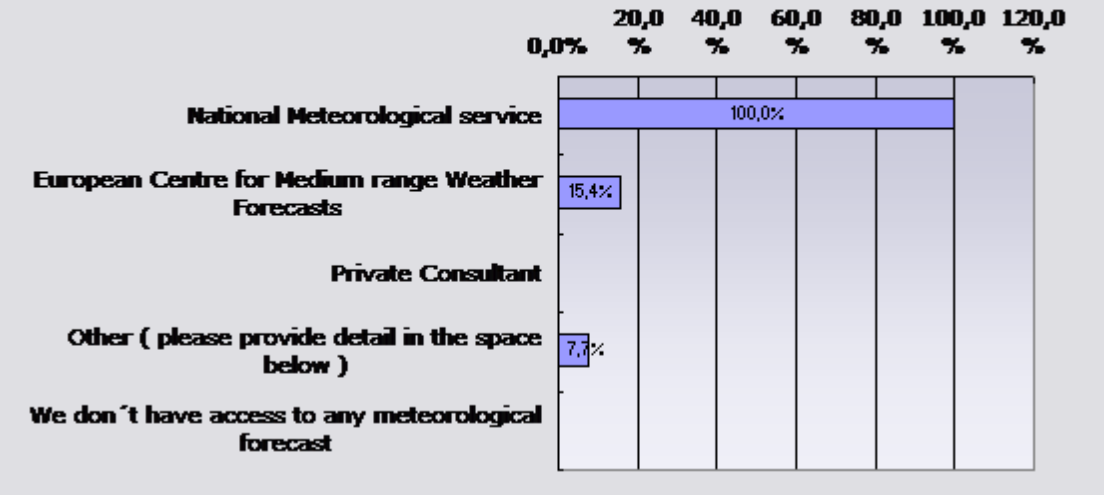


	Percentage	Count
Jointly	31,6%	6
Separately	42,1%	8
N/A	26,3%	5
Respondents		19
No response		7

Email	First name	Last name	Info	Comments
armstate@meteo.am				on based of meteorological forecast
ramazchitanava@rambler.ru				The forecast is made jointly but initial evaluation is done separately.
reinhold.godina@lebensministerium.at				The Hydrological Service and the Central Institute for Meteorology and Geodynamics (ZAMG) are separated and organized in different form. The precipitation forecasts come exclusively from the Meteorological Service (ZAMG).

**4. GENERAL**

**If your service is not a joint hydrometeorological service, who is providing the meteorological forecast?**

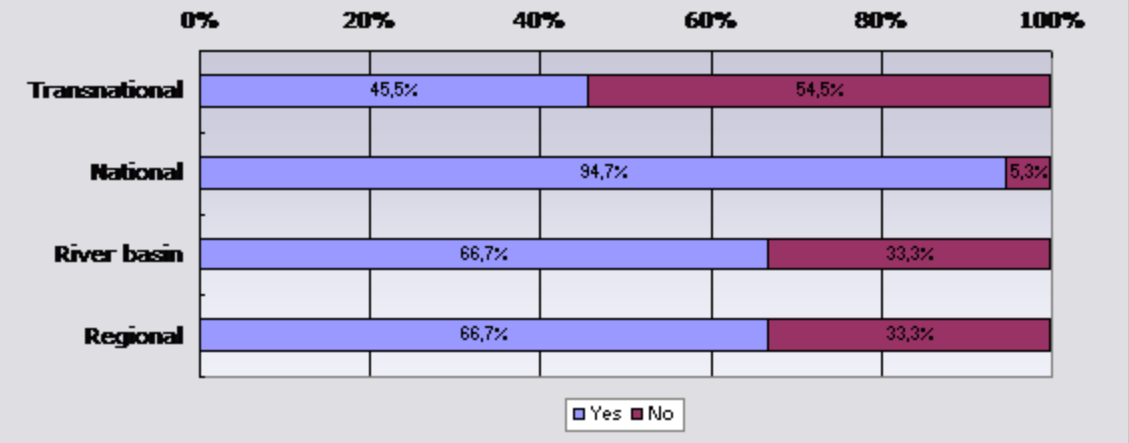


	Percentage	Count
National Meteorological service	100,0%	13
European Centre for Medium range Weather Forecasts	15,4%	2
Private Consultant	0,0%	0
Other ( please provide detail in the space below )	7,7%	1
We don't have access to any meteorological forecast	0,0%	0
Respondents		13
No response		13

Email	First name	Last name	Info	Comments and remarks
charles.galdies@maltaairport.com				Separate Hydrological advisors are appointed by the Govt for WMO.  The NMS falls within a private company (Malta International Airport)

**5. GENERAL**

**On which scale is your service responsible for flood forecasting?**

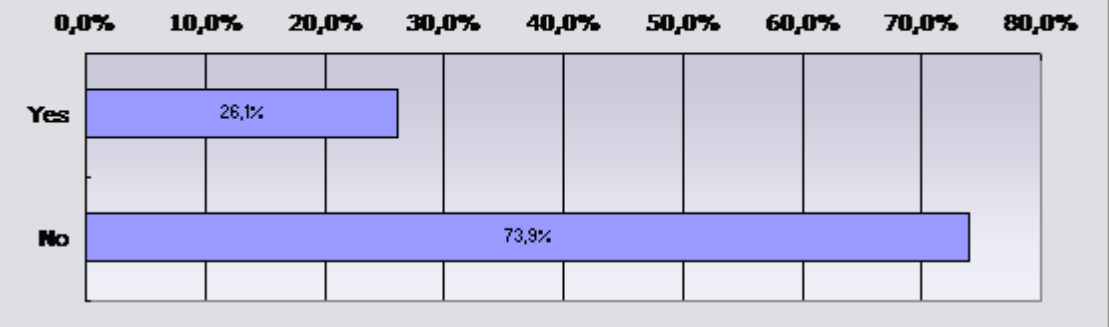


	Yes	No	Respondents	No response
Transnational	45,5%	54,5%	11	15
National	94,7%	5,3%	19	7
River basin	66,7%	33,3%	12	14
Regional	66,7%	33,3%	12	14
Total			22	4

Email	First name	Last name	Info	Comments
charles.galdies@maltairport.com				Our Services provide local authorities with near-real time forecasting of flash flooding
danelka@chmi.cz				There is trans national cooperation with Austria, Slovakia, Poland and Germany. CZ provide forecast at border so far.
director@hnms.gr				HNMS is responsible for intense rainfall forecasting on national scale
ramazchitanava@rambler.ru				The forecast is done on National level but it serves for Azerbaijan Republic as The biggest river of South Caucasus - Kura is trans national river
reinhold.godina@lebensministerium.at				Austria has a federal structure with nine provincial states. According to this structure the responsibility for the flood forecasting was assigned to the local -provincial- Hydrological Services.
teresa.abrantes@meteo.pt				IM is not directly responsible for flood forecasting only for warning and forecast heavy precipitation at national and regional level

**6. GENERAL**

**Does any other organisation issue forecasts or warnings for the same area or river basin?**

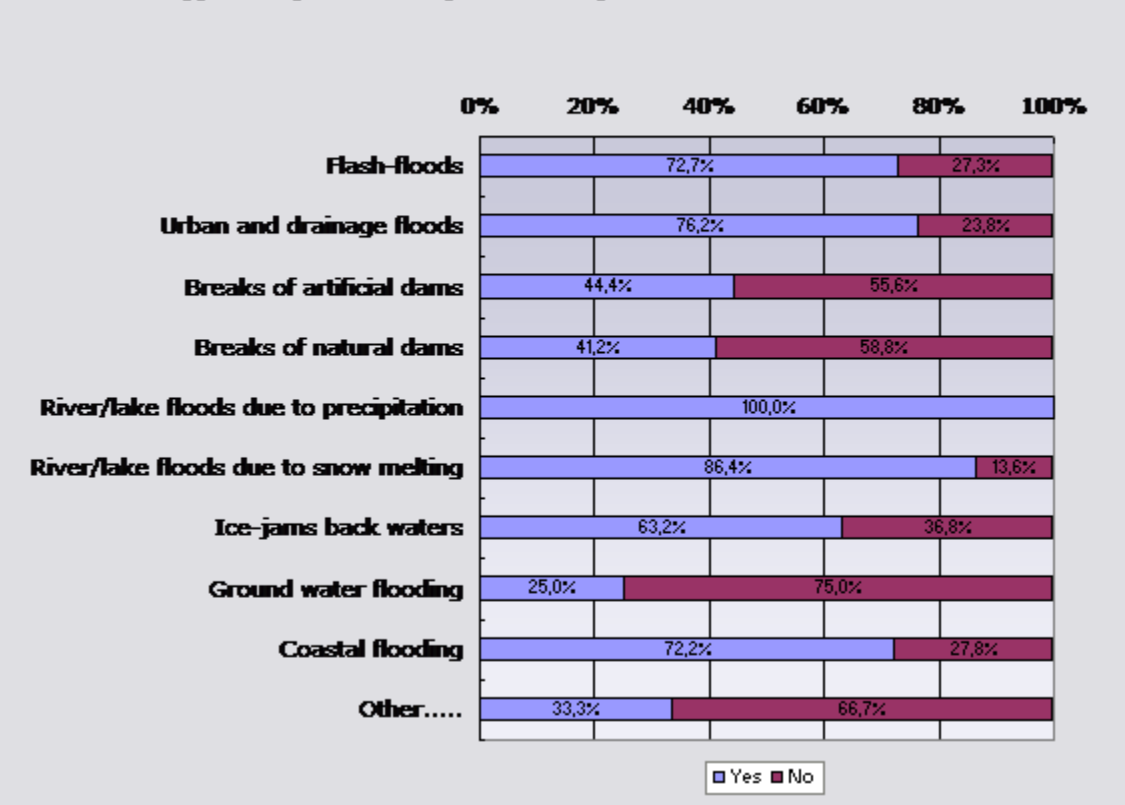


	Percentage	Count
Yes	26,1%	6
No	73,9%	17
Respondents		23
No response		3

Email	First name	Last name	Info	If yes, which organization
cs@dmi.dk				Farvandsvæsenet, Danish Maritime Safety Administration. Only graphical forecasts, no warnings.
danelka@chmi.cz				River Authorities operate own model, but not making outputs public. Law speaks about CHMI-River authorities cooperation on FF
daniela.kyselova@shmu.sk				Water authorities - warnings
markku.puupponen@ymparisto.fi				Regional Environment Centres give notices and warnings of flood based on SYKEs flood forecasts. SYKE = Finnish Environment Institute
reinhold.godina@lebensministerium.at				The responsibility for the flood forecasting was assigned to the local -provincial- Hydrological Services.
teresa.abrantes@meteo.pt				The Portuguese Water Institute based on our precipitation forecast
therese.buergi@bafu.admin.ch				Not yet, private companies are planning to issue flood warnings within the next months

**7. GENERAL**

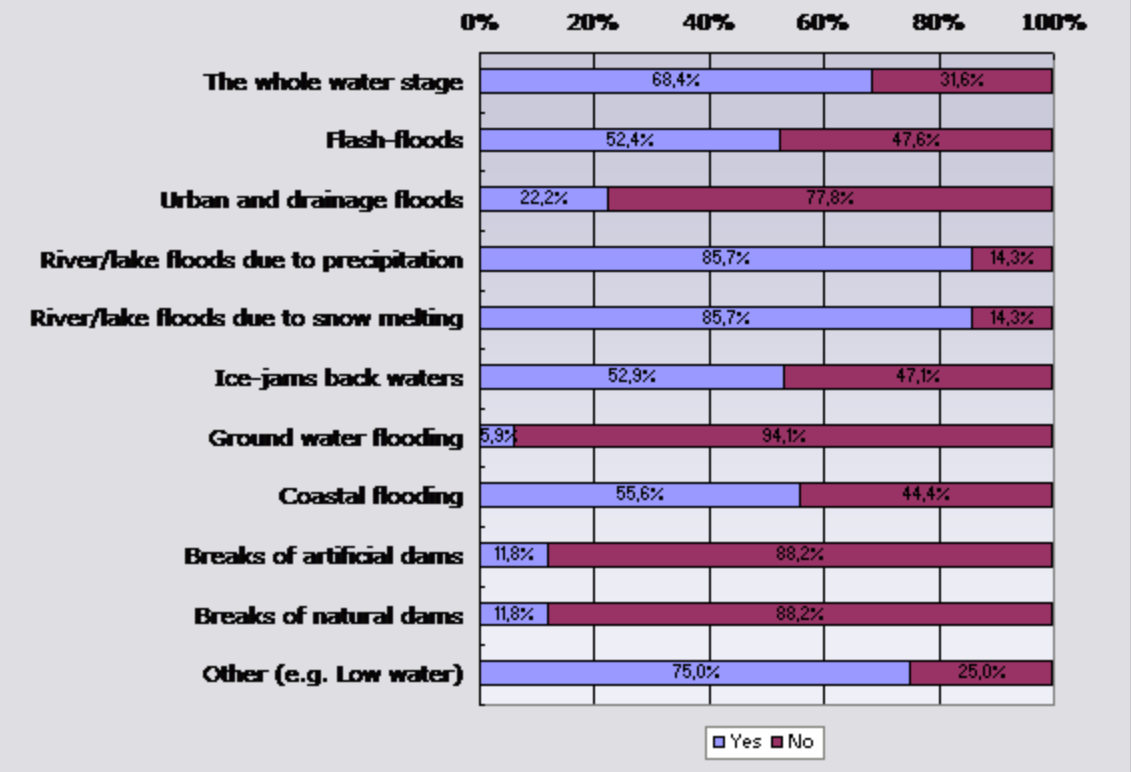
**Which flood types do you face in your country?**



	Yes	No	Respondents	No response
Flash-floods	72,7%	27,3%	22	4
Urban and drainage floods	76,2%	23,8%	21	5
Breaks of artificial dams	44,4%	55,6%	18	8
Breaks of natural dams	41,2%	58,8%	17	9
River/lake floods due to precipitation	100,0%	0,0%	21	5
River/lake floods due to snow melting	86,4%	13,6%	22	4
Ice-jams back waters	63,2%	36,8%	19	7
Ground water flooding	25,0%	75,0%	16	10
Coastal flooding	72,2%	27,8%	18	8
Other.....	33,3%	66,7%	3	23

Email	First name	Last name	Info	Comments and remarks
danelka@chmi.cz				Urban floods and dam break may occur, but are very rare...
karl-heinz.daamen@lfu.bayern.de				Alpine torrent floods
therese.buergi@bafu.admin.ch				Breaks of artificial dams and natural dams are of course possible but haven't been observed in the last decades.  breakout of glacier lakes are observed

**8. GENERAL**  
**Do you forecast\_\_\_\_\_**

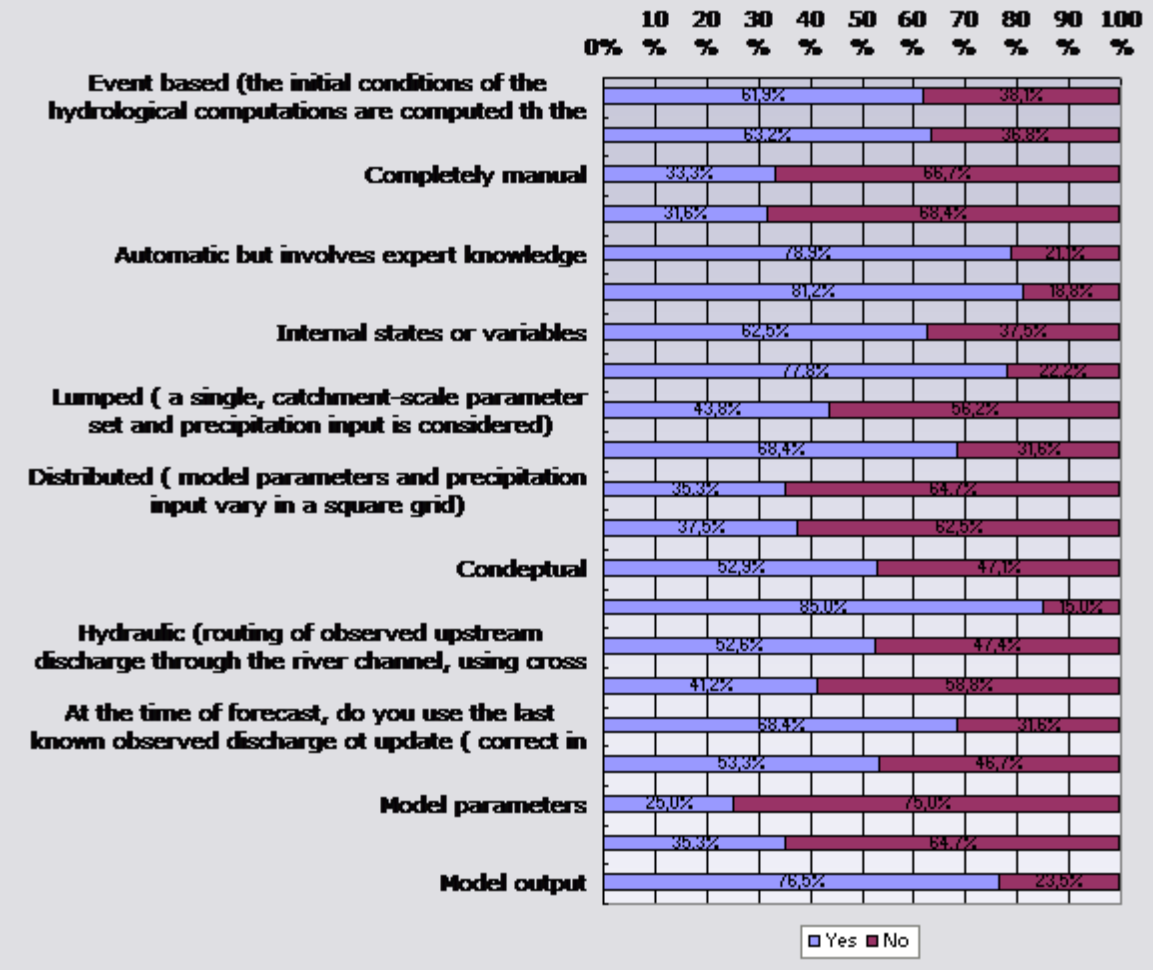


	Yes	No	Respondents	No response
The whole water stage	68,4%	31,6%	19	7
Flash-floods	52,4%	47,6%	21	5
Urban and drainage floods	22,2%	77,8%	18	8
River/lake floods due to precipitation	85,7%	14,3%	21	5
River/lake floods due to snow melting	85,7%	14,3%	21	5
Ice-jams back waters	52,9%	47,1%	17	9
Ground water flooding	5,9%	94,1%	17	9
Coastal flooding	55,6%	44,4%	18	8
Breaks of artificial dams	11,8%	88,2%	17	9
Breaks of natural dams	11,8%	88,2%	17	9
Other (e.g. Low water)	75,0%	25,0%	12	14

Email	First name	Last name	Info	Comments and remarks
bogdan.ozga-zielinski@imgw.pl				Low water
danhelka@chmi.cz				Ice jams are forecasted not localized.
hamza.ozguler@dsi.gov.tr				We are now trying to develop our forecasting abilities
karl-heinz.daamen@lfu.bayern.de				Our service receives warnings of ice-jams reports from local water management authorities and reports on ice effects at rivers
moj@nve.no				We issue special messages related to the possibility of : urban and drainage floods, ice-jams and backwater, ice conditions, local floods due to heavy rain, ground- and soil water condition; normally at a regional or river basin level. However, in the forecasts we also differ between small, medium and regulated rivers. In some rivers we forecast water levels during a flood situation. This issue is under development.
teresa.abrantes@meteo.pt				The Portuguese Water Institute forecast namely river floods due to precipitation

**9. Forecasting methods and model.**

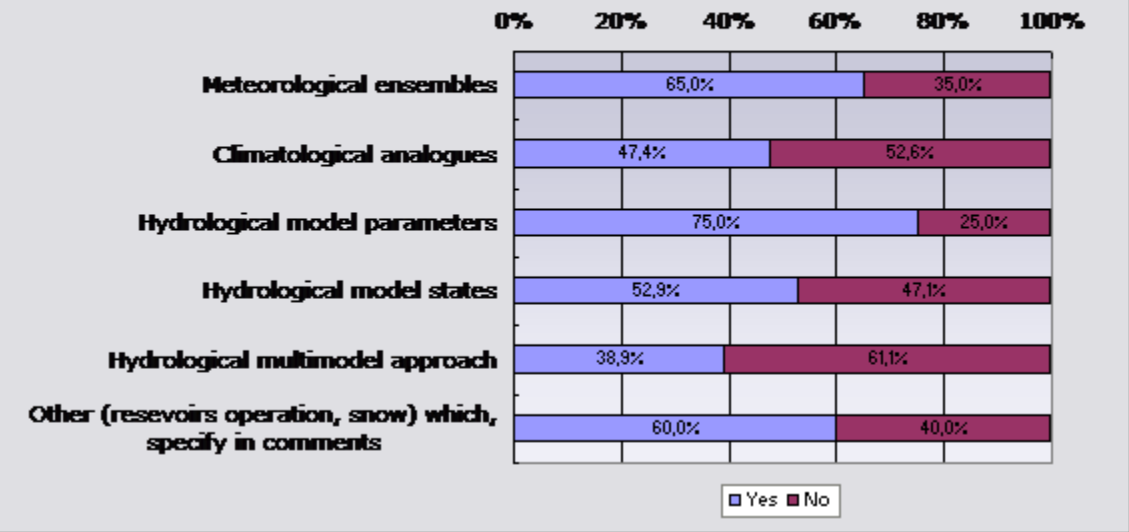
**Which methods and models for flood forecasting do you use?**



	Yes	No	Respondents	No response
Event based (the initial conditions of the hydrological computations are computed in the beginning of an event)	61,9%	38,1%	21	5
Continuous ( the model computes continuously the internal states, and does not need any initial conditions adjustment in the beginning of an event)	63,2%	36,8%	19	7
Completely manual	33,3%	66,7%	18	8
Completely automatic	31,6%	68,4%	19	7
Automatic but involves expert knowledge	78,9%	21,1%	19	7
If it involves expert knowledge, does the expert judgement allows to adjust in real time the following parameters: Input data	81,2%	18,8%	16	10
Internal states or variables	62,5%	37,5%	16	10

Model output	77,8%	22,2%	18	8
Lumped ( a single, catchment-scale parameter set and precipitation input is considered)	43,8%	56,2%	16	10
Semi-distributed ( model parameters and precipitation input vary in sub catchments)	68,4%	31,6%	19	7
Distributed ( model parameters and precipitation input vary in a square grid)	35,3%	64,7%	17	9
Black-box ( regression, neural network, fuzzy logic)	37,5%	62,5%	16	10
Conceptual	52,9%	47,1%	17	9
Hydrological ( precipitation-runoff)	85,0%	15,0%	20	6
Hydraulic (routing of observed upstream discharge through the river channel, using cross section info)	52,6%	47,4%	19	7
Coupled Hydrological-Hydraulic ( routing of forecasted upstream discharge through the river channel, using cross section info)	41,2%	58,8%	17	9
At the time of forecast, do you use the last known observed discharge to update (correct in real time) the hydrological model?	68,4%	31,6%	19	7
If yes, on which component does the updating method apply, precipitation input	53,3%	46,7%	15	11
Model parameters	25,0%	75,0%	16	10
Model internal states	35,3%	64,7%	17	9
Model output	76,5%	23,5%	17	9

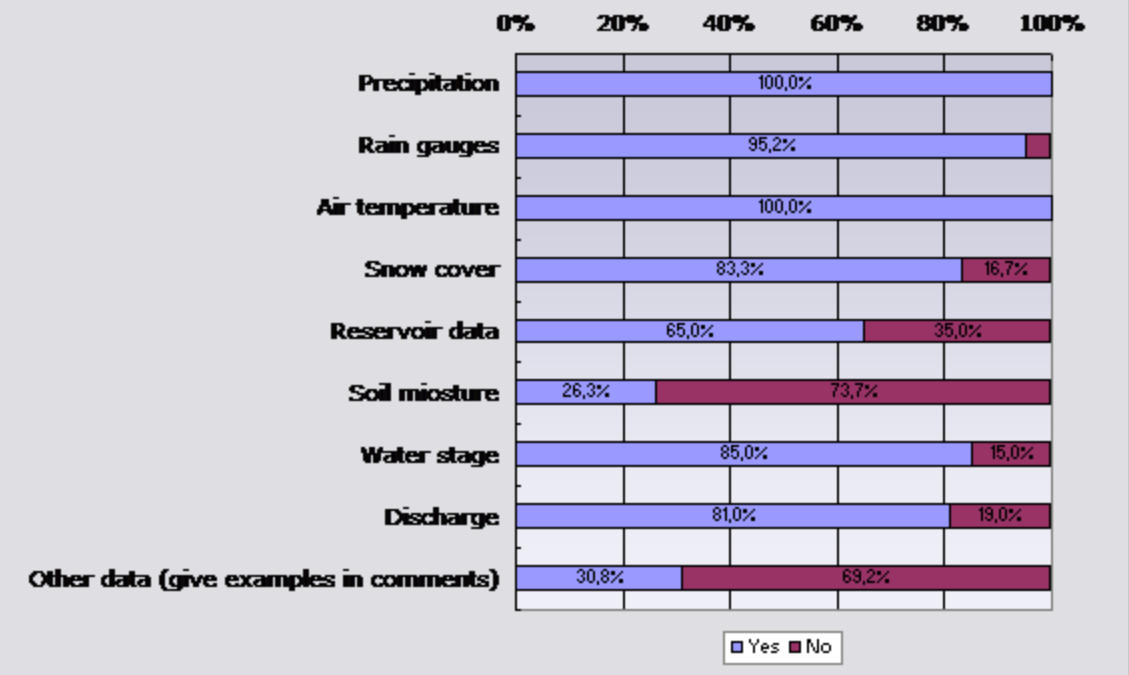
**10. Forecasting methods and models  
Do you use...**



	Yes	No	Respondents	No response
Meteorological ensembles	65,0%	35,0%	20	6
Climatological analogues	47,4%	52,6%	19	7
Hydrological model parameters	75,0%	25,0%	20	6
Hydrological model states	52,9%	47,1%	17	9
Hydrological multi model approach	38,9%	61,1%	18	8
Other (reservoirs operation, snow) which, specify in comments	60,0%	40,0%	15	11

Email	First name	Last name	Info	Comments and remarks
anc@ceh.ac.uk				The storage of water in reservoirs, or flood storage areas is included in hydrodynamic forecasting models as are the operational of flood structures. The presence and impact of snow is included in models.
bogdan.ozga-zielinski@imgw.pl				Snowmelt formula
charles.galdies@maltairport.com				Based on doppler weather radar output, atmospheric numerical models
cs@dmi.dk				Deterministic 3-D dynamic numerical oceanographic model for forecasting sea level
danelka@chmi.cz				Reservoirs. Meteo ensemble has only 2-4 members as is made manually by meteo forecaster
karl-heinz.daamen@lfu.bayern.de				Reservoir operation, snow melt forecasts, for some river basins we have more than one forecast model but always one is preferred so it is not a multi model approach
markku.puupponen@ymparisto.fi				Reservoir operation included Snow line measurements included
moj@nve.no				snow
ramazchitanava@rambler.ru				reservoirs operation, snow cover that are defined by field works

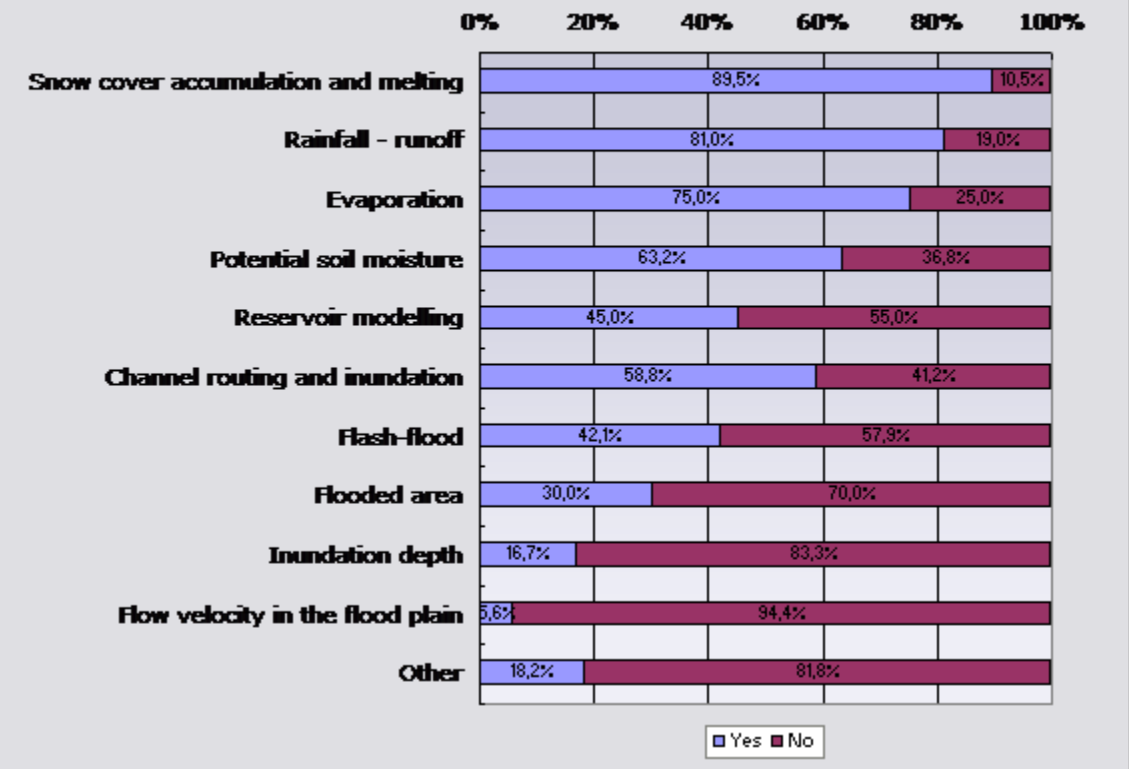
**11. Forecasting methods and models**  
**Which realtime data do you use?**



	Yes	No	Respondents	No response
Precipitation	100,0%	0,0%	22	4
Rain gauges	95,2%	4,8%	21	5
Air temperature	100,0%	0,0%	20	6
Snow cover	83,3%	16,7%	18	8
Reservoir data	65,0%	35,0%	20	6
Soil moisture	26,3%	73,7%	19	7
Water stage	85,0%	15,0%	20	6
Discharge	81,0%	19,0%	21	5
Other data (give examples in comments)	30,8%	69,2%	13	13

Email	First name	Last name	Info	Comments
anc@ceh.ac.uk				Air temperature is used as a surrogate for the presence of snow. Soil moisture is a weekly value fed into models. Other real-time data include wave data from wave bouys.
augulienne@meteo.lt				Evaporation (statistical data) and surface indicators.
bedr@mecom.ru				soil freezing depth
charles.galdies@maltairport.com				Weather radar
daniela.kyselova@shmu.sk				Snow cover - weakly
director@hnms.gr				This data is used for the assimilation of the meteorological forecasting model, not for a hydrological one.
karl-heinz.daamen@lfu.bayern.de				Snow cover and melt forecasts, radiation, wind speed, air humidity, air pressure, forecasts of reservoir and hydropower plant operations, operation of water crossovers, flood forecasts of neighbouring services
markku.puupponen@ymparisto.fi				Soil moisture only six stations Snow water equivalent biweekly
therese.buergi@bafu.admin.ch				wind-speed dew point

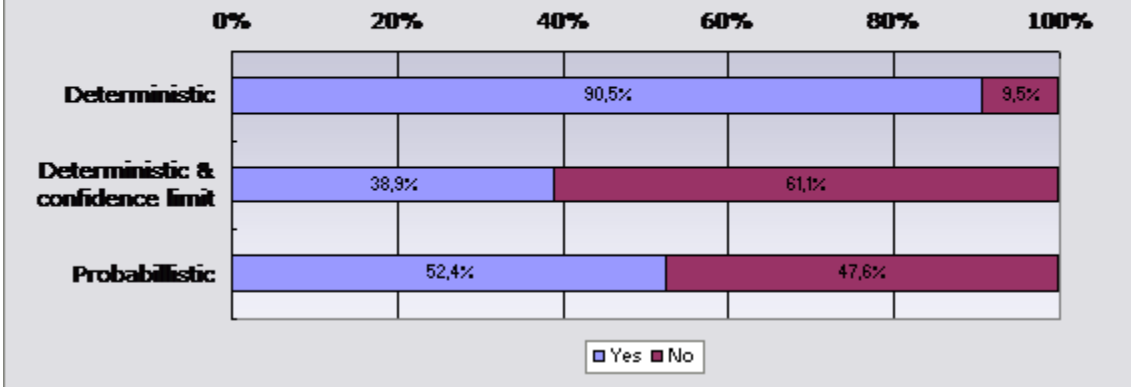
**12. Forecasting methods and models.  
Which processes do you model?**



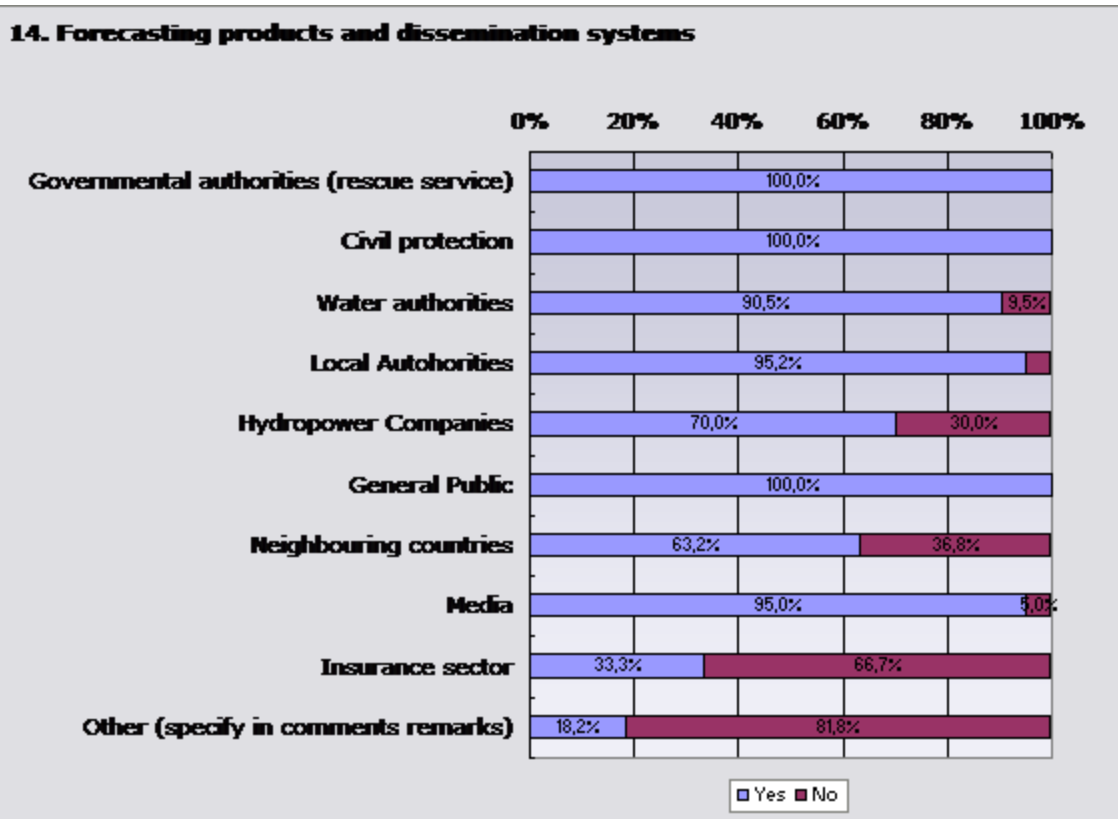
	Yes	No	Respondents	No response
Snow cover accumulation and melting	89,5%	10,5%	19	7
Rainfall - runoff	81,0%	19,0%	21	5
Evaporation	75,0%	25,0%	20	6
Potential soil moisture	63,2%	36,8%	19	7
Reservoir modelling	45,0%	55,0%	20	6
Channel routing and inundation	58,8%	41,2%	17	9
Flash-flood	42,1%	57,9%	19	7
Flooded area	30,0%	70,0%	20	6
Inundation depth	16,7%	83,3%	18	8
Flow velocity in the flood plain	5,6%	94,4%	18	8
Other	18,2%	81,8%	11	15

Email	First name	Last name	Info	Comments and remarks
anc@ceh.ac.uk				Inundation and flow velocity are not forecast in real-time, but are modelled in advance for specific flood risk areas. There are future plans for the real-time modelling of these variables.
bedr@mecom.ru				Thickness of ice Formation of ice
charles.galdies@maltairport.com				No hydro models are used, although we would be interested to avail ourselves from one through cooperation with WMO
cs@dmi.dk				LAM-model output for precipitation, dynamic oceanographic model for sea level
danelka@chmi.cz				Flash flood model under development
director@hnms.gr				These are forecasted fields of the meteorological models
karl-heinz.daamen@lfu.bayern.de				Almost snow cover accumulating and melting forecasts of the National Weather Service are used but additionally we calculate snow conditions ourselves
markku.puupponen@ymparisto.fi				Actual soil moisture

**13. Forecasting products and dissemination systems**  
**Which type of forecasting products do you produce?**



	Yes	No	Respondents	No response
Deterministic	90,5%	9,5%	21	5
Deterministic & confidence limit	38,9%	61,1%	18	8
Probabilistic	52,4%	47,6%	21	5



	Yes	No	Respondents	No response
Governmental authorities (rescue service)	100,0%	0,0%	22	4
Civil protection	100,0%	0,0%	22	4
Water authorities	90,5%	9,5%	21	5
Local Authorities	95,2%	4,8%	21	5
Hydropower Companies	70,0%	30,0%	20	6
General Public	100,0%	0,0%	22	4
Neighbouring countries	63,2%	36,8%	19	7
Media	95,0%	5,0%	20	6
Insurance sector	33,3%	66,7%	18	8
Other (specify in comments remarks)	18,2%	81,8%	11	15

\* Clarification: Question 14 is about the users to the forecasting products.

Email	First name	Last name	Info	Comments and remarks
anc@ceh.ac.uk				Forecasting data is provided to a host of different parties in different formats, based on the client needs and responsibilities.
bedr@mecom.ru				River transport companies Municipal services
director@hnms.gr				HNMS participates to the EMMA programme- Meteoalarm
hamza.ozguler@dsi.gov.tr				in existing situation we are still in developing stage
karl-heinz.daamen@lfu.bayern.de				navigation
teresa.abrantes@meteo.pt				IM forecasts heavy precipitation and not flood forecasting.

## 15. Forecasting products and dissemination systems.

### If you produce probabilistic information, can you exemplify?

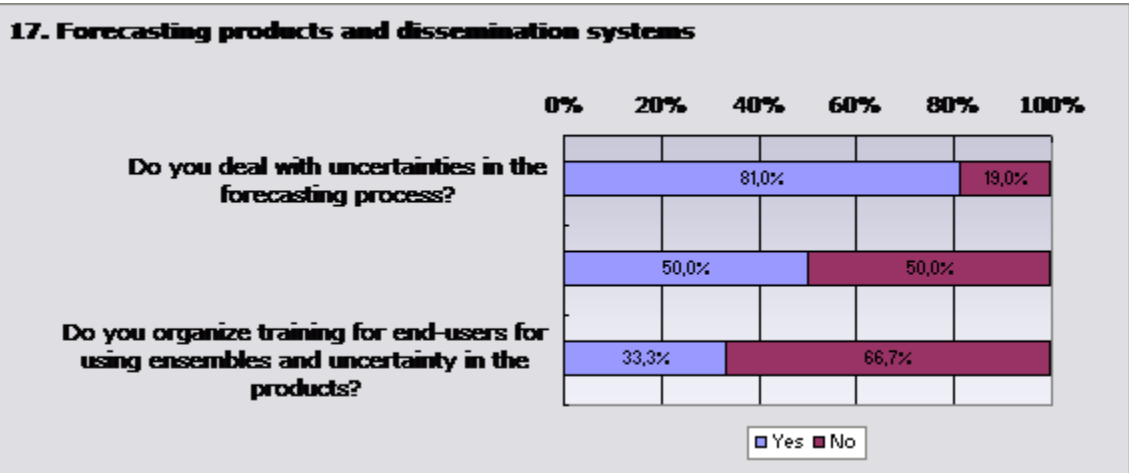
Email	First name	Last name	Info	Response
armstate@meteo.am				Text and table information by fax, phone and e-mail.
cs@dmi.dk				Direct contacts via phone, mail, fax along with web-bases forecasts: <a href="http://www.dmi.dk/dmi/index/danmark/vandstand.htm">http://www.dmi.dk/dmi/index/danmark/vandstand.htm</a> <a href="http://ocean.dmi.dk/anim/index.php">http://ocean.dmi.dk/anim/index.php</a>
danhelka@chmi.cz				not yet, under development
director@hnms.gr				Probabilities for precipitation amounts from ECMWF EPS model and LEPS ( Local model Ensemble System-COSMO
gunlog.wennerberg@smhi.se				Hydrological EPS, hydrological probabilistic forecasts
markku.puupponen@ymparisto.fi				<a href="http://www.environment.fi/waterforecast">www.environment.fi/waterforecast</a>
piet.warmerdam@wur.nl				ECMWF ensemble forecasts COSMO LEPS ensembles
ramazchitanava@rambler.ru				Forecasting products are as follows: Water level, discharge, Area impacted with flood. If deterministic forecast is not valuable than probabilistic forecasts are issued.
reinhold.godina@lebensministerium.at				<a href="http://www.noel.gv.at/Externeseiten/wasserstand/wiskiwebpublic/maps_QProg12_0.htm?entryparakey=QProg12">http://www.noel.gv.at/Externeseiten/wasserstand/wiskiwebpublic/maps_QProg12_0.htm?entryparakey=QProg12</a>
teresa.abrantes@meteo.pt				For a local: probability of 60% of rainfall 20 mm in 3 hour
therese.buergi@bafu.admin.ch				<a href="http://www.hydrodaten.admin.ch/lhg/vorhersage/bulletins/mapdphase/hbv_cleps_CH_2289.png">http://www.hydrodaten.admin.ch/lhg/vorhersage/bulletins/mapdphase/hbv_cleps_CH_2289.png</a>

## 16. Forecasting products and dissemination system

### What lead times do you have for your forecasts/warnings?

Email	First name	Last name	Info	Response
anc@ceh.ac.uk				Deterministic flood warnings to the public are provided with a 2 hour lead time. Flood forecasts may be provided to other clients up to 36 hours before an event.
armstate@meteo.am				12-24 hour
auguliene@meteo.lt				1 - 4 days
bedr@mecom.ru				The lead time for: - the flash floods forecasts is from 1 till 3 hours; - the ice jams - from 1 hour till 1 day; - the daily discharges (water levels) in large river basin - from 1 till 5 days; - the forecasts of maximum water levels during the spring floods - from 10-15 days till 1,5 - 2,0 months; - water inflow into the reservoirs - from 1 till 3 months; - term of ice cover formation and destruction - from 1 till 2 months.
bogdan.ozga-zielinski@imgw.pl				from 24 to 72
charles.galdies@maltairport.com				approx 60 minutes lead time
cs@dmi.dk				18hours for flash floods and sea level in the North sea areas, 7hours for the sea level in the Baltic, the Belts & the Sound, Kattegat area.
danelka@chmi.cz				48 hour forecast. Warning 24-48 h, if pre-warning is possible (fe snow melt) than 2-4 days.
daniela.kyselova@shmu.sk				24, 72 hours for forecasts, 6 hours for warnings
director@hnms.gr				HNMS issues weather forecasts and warnings of varying lead times.
gunlog.wennerberg@smhi.se				up to 96 hours
inita.stikute@meteo.lv				1 - 7 days
jaan.saar@emhi.ee				24 hours
karl-heinz.daamen@lfu.bayern.de				6 to 24 hours forecasts are published; internally forecasts of up to 7 days are calculated. Warning may be given more than 24 hours in advance but are given by other authorities which receive pre-information from our institute
markku.puupponen@ymparisto.fi				1-30 days
moj@nve.no				6 days
piet.warmerdam@wur.nl				up to 10 days

ramazchitanava@rambler.ru			Generally the forecasts are issued one month ahead but the corrections are done for the whole periods. The warnings are issued basically two weeks ahead
reinhold.godina@lebensministerium.at			12h, 24h, 48h
teresa.abrantes@meteo.pt			The forecasts/warnings of heavy precipitation should be issue as soon as possible (12-24 h), not less than 3 hours (if possible)
therese.buergi@bafu.admin.ch			hydrological forecast based on the following meteo-model: COSMO2 --> <240h



	Yes	No	Respondents	No response
Do you deal with uncertainties in the forecasting process?	81,0%	19,0%	21	5
Is some indication of uncertainty given to the users?	50,0%	50,0%	20	6
Do you organize training for end-users for using ensembles and uncertainty in the products?	33,3%	66,7%	21	5

Email	First name	Last name	Info	Comments
anc@ceh.ac.uk				We are currently undertaking extensive research in this area in order to fully adopt probabilistic forecasting into practise.
armstate@meteo.am				WE provide consultation for end -users
charles.galdies@maltairport.com				Would be interested in training
danelka@chmi.cz				Uncertainty is consider, but deterministic forecast is produced only
hamza.ozguler@dsi.gov.tr				we are at the beginning stage
teresa.abrantes@meteo.pt				Not implemented yet

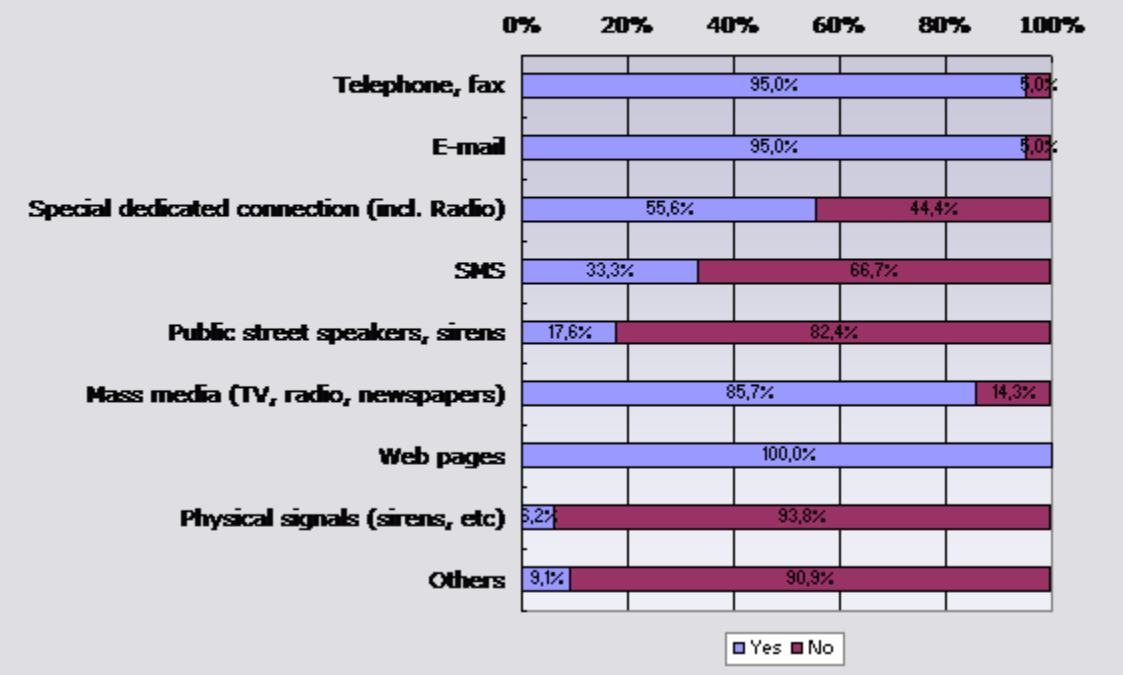
## 18. Forecasting products and dissemination systems

**What are the main demands of the users (e.g. new products, frequent forecasts) for today and for future years?**

Email	First name	Last name	Info	Response
anc@ceh.ac.uk				Increase lead times for flood events. Increased information about the depth, velocity and spatial extent of flooding. Increased demands for information about every type of flooding (groundwater, tidal, flash floods etc).
armstate@meteo.am				frequent forecasts for future days
auguliene@meteo.lt				Users often require for GIS system
bedr@mecom.ru				<ol style="list-style-type: none"> <li>1. To develop the reliable automated methods of flash floods forecasts</li> <li>2. To develop the reliable automated methods of forecasting of total inflow of water into the reservoirs with lead term from 1 till 3 months</li> <li>3. Development of reliable methods of long-term forecasts of maximum water levels during the spring floods.</li> <li>4. Development of reliable methods of dangerous ice jams forecasting.</li> </ol>
bogdan.ozga-zielinski@imgw.pl				frequent forecasts, graphical visualization of forecasts
charles.galdies@maltaairport.com				Resources authorities are interested in new products
cs@dmi.dk				Skill, precision
danhelka@chmi.cz				Longer lead time of forecast and higher frequency. for long future - probabilities
daniela.kyselova@shmu.sk				increase number and quality of issued hydrological forecast, flash-floods forecasts, flooded area, risk flood maps
director@hnms.gr				Time and space specific flood forecasts and warnings for use by farmers, tourists and general public
gunlog.wennerberg@smhi.se				new, better forecasting products
inita.stikute@meteo.lv				Flooding areas, water level and discharge, terms of ice brake, ice jams
jaan.saar@emhi.ee				new products and frequent forecast
karl-heinz.daamen@lfu.bayern.de				Users want a reliable, long term and precise forecast which is not realistic. Flood forecasting organisations must make the user aware of the uncertainties of weather and flood forecasts.
markku.puupponen@ymparisto.fi				Flood forecasts and flood warnings

moj@nve.no			Better spatial and temporal resolution, quantitative forecasts
piet.warmerdam@wur.nl			higher accuracy more information on uncertainty
ramazchitanava@rambler.ru			No any new products are installed in the work of NMHS. The new is using of newly constructed dams for flooding regulation where possible based on issued forecasts
reinhold.godina@lebensministerium.at			Improve the researches in the field of the precipitation forecast.
teresa.abrantes@meteo.pt			More frequent and accurate forecasts. Monthly and seasonal forecasts
therese.buergi@bafu.admin.ch			'-higher accuracy of forecasts! -indication of return period of event -more frequently updated forecasts -customer tailored products -switch from just disseminating model output towards products with interpretation (like in meteorology!) -enhanced graphical preparation of products -active information (push-mode) via different communication channels (mail, fax, sms etc.)

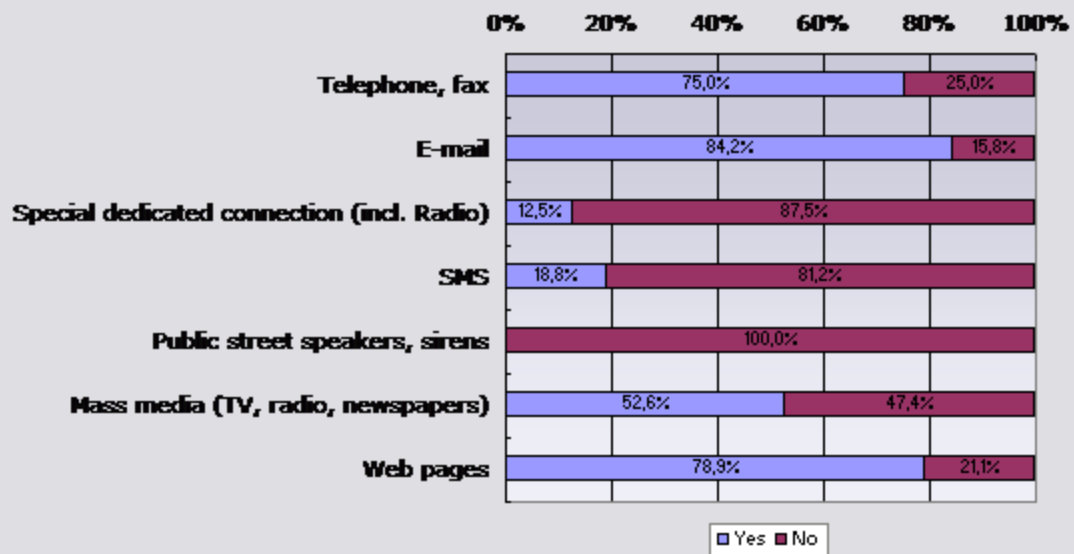
**19. Forecasting products and dissemination systems**  
**How do you disseminate flood warnings?**



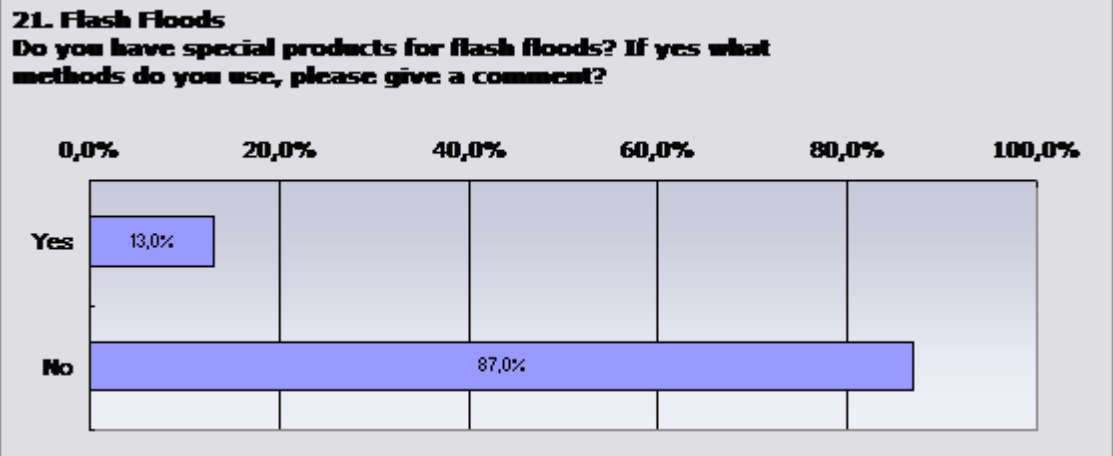
	Yes	No	Respondents	No response
Telephone, fax	95,0%	5,0%	20	6
E-mail	95,0%	5,0%	20	6
Special dedicated connection (incl. Radio)	55,6%	44,4%	18	8
SMS	33,3%	66,7%	18	8
Public street speakers, sirens	17,6%	82,4%	17	9
Mass media (TV, radio, newspapers)	85,7%	14,3%	21	5
Web pages	100,0%	0,0%	21	5
Physical signals (sirens, etc)	6,2%	93,8%	16	10
Others	9,1%	90,9%	11	15

Email	First name	Last name	Info	Comments
anc@ceh.ac.uk				Other dissemination routes include flood wardens in local communities.
director@hnms.gr				The warnings and the other forecasting products are issued for intense rainfalls
hamza.ozguler@dsi.gov.tr				Now we don't disseminate our forecasts.
jaan.saar@emhi.ee				Local authorities in coastal areas are testing sirens
karl-heinz.daamen@lfu.bayern.de				Flood warnings are given by other (regional) water management authorities based on our flood forecasts. We operate the databases and web servers on which the warnings are published. Additionally we write flood reports, have contact to ministries and the media. Public street speakers, sirens etc. are used by local responsible authorities but not by us.
teresa.abrantes@meteo.pt				IM do not disseminate flood warnings, Civil Protection does with information from the Water Institute.

**20. Forecasting products and dissemination systems**  
**How do you disseminate other flood forecasting products (f.e. discharge forecast, flood maps etc)?**



	Yes	No	Respondents	No response
Telephone, fax	75,0%	25,0%	20	6
E-mail	84,2%	15,8%	19	7
Special dedicated connection (incl. Radio)	12,5%	87,5%	16	10
SMS	18,8%	81,2%	16	10
Public street speakers, sirens	0,0%	100,0%	16	10
Mass media (TV, radio, newspapers)	52,6%	47,4%	19	7
Web pages	78,9%	21,1%	19	7



	Percentage	Count
Yes	13,0%	3
No	87,0%	20
Respondents		23
No response		3

Email	First name	Last name	Info	Comments
anc@ceh.ac.uk				Some areas have sirens in place for flash floods. These are highly localised and do not cover all catchments at risk from flash flooding. New options are currently under investigation.
danelka@chmi.cz				Under development - infiltration (CN) and radar QPE combination
daniela.kyselova@shmu.sk				There are two local warning systems in Slovakia.
director@hnms.gr				The flood management is carried out jointly by HNMS and the Hellenic Civil Protection Authority-HCPA. HNMS issues, as needed, intense rainfall forecasts and warnings. These products are disseminated to the HCPA, which respectively sends emergency warnings about the danger of floods to all Regional Authorities such as Prefectures and Municipalities. Additionally, these warnings are disseminated to the general public, the media etc.
karl-heinz.daamen@lfu.bayern.de				Not predictable with reasonable lead time and reliability
therese.buergi@bafu.admin.ch				Depends on where you divide between flash flood and other floods: we issue flood warnings for catchments < 400 km <sup>2</sup> based coupling meteo-models and hydrological models. specified procedures and products for smaller catchments are in evaluation

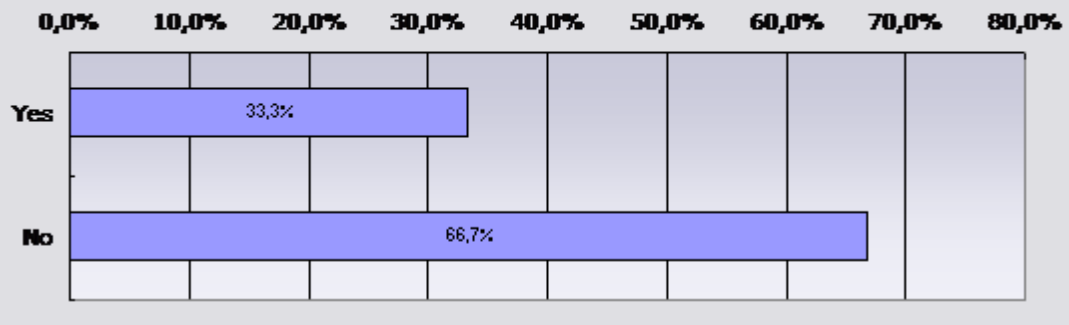
## 22. Flash Floods

### How do you disseminate flash flood warnings?

Email	First name	Last name	Info	Response
anc@ceh.ac.uk				Currently we have no fixed methods of disseminating warnings with less than a 2 hour lead time.
augulienne@meteo.lt				Fax, E- mail, mass media.
bedr@mecom.ru				Telephone, fax, e-mail, radio, tv
charles.galdies@maltaairport.com				Telephone, fax, internet
cs@dmi.dk				web, e-mail, fax telephone
danelka@chmi.cz				Same as flood warning - one commons system in CZ (main is fire rescue office to disseminate)
daniela.kyselova@shmu.sk				By SMS
director@hnms.gr				We have answered in question 21.
hamza.ozguler@dsi.gov.tr				No.
piet.warmerdam@wur.nl				Not
ramazchitanava@rambler.ru				They are disseminated to all interested users by: Fax, mass media, mail, special bulletins
reinhold.godina@lebensministerium.at				no warning available
therese.buergi@bafu.admin.ch				in the same way like other flood warnings: sms, fax, mail

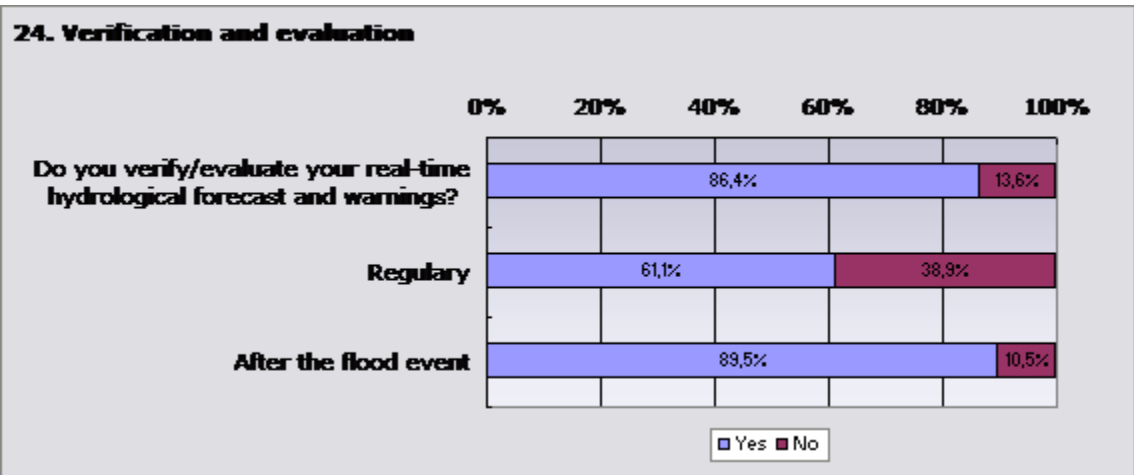
**23. Flash Floods**

**Are there any local warning systems in your country/region, if yes please give a comment**

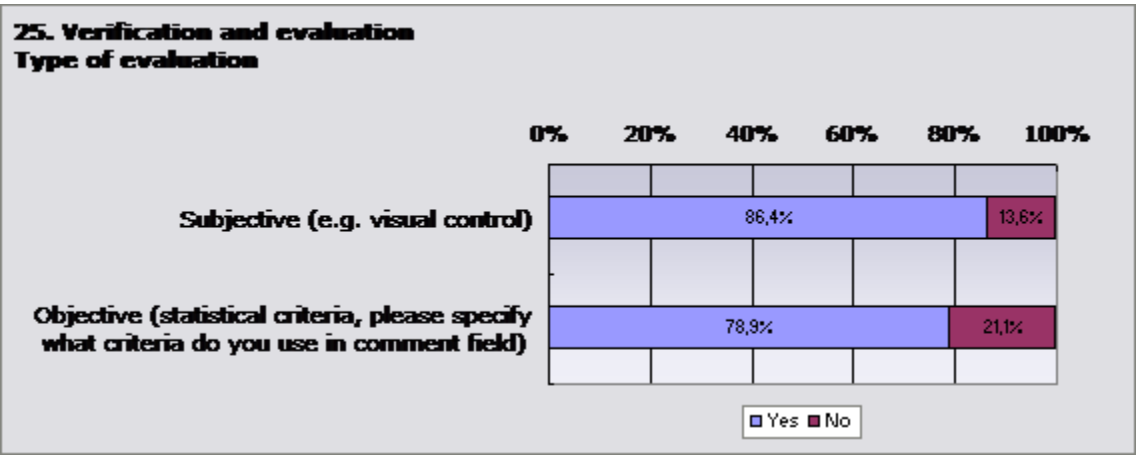


	Percentage	Count
Yes	33,3%	7
No	66,7%	14
Respondents		21
No response		5

Email	First name	Last name	Info	Comments
anc@ceh.ac.uk				Warnings are produced by Floodline Warnings Direct - a national system; although the warning message is written and sent out locally.
bedr@mecom.ru				The Warning Systems function at nation-wide, regional and local levels. There are special flood commissions. The broad audience of experts (hydrometeorological service, medical service, experts on water management, experts of the EMERCOM, militararians, etc.) take part in the activities of these commissions.
bogdan.ozga-zielinski@imgw.pl				we have a few local flood warning systems in mountain regions
charles.galdies@maltairport.com				Sirens
danelka@chmi.cz				Usually only automatic water gauge, sometimes with rain gauges sending warning SMS if threshold rain, flow exceeded.
daniela.kyselova@shmu.sk				Two pilot local warning systems, based on the information from terrestrial stations, have been established in Slovakia. Upon the continuous monitoring of changes in precipitation activity development and state of the respective water flow level, the local warning system will transmit warning messages in case of exceeding the advanced setting limits.
ramazchitanava@rambler.ru				NMHS of Georgia has several branches in the regions of Georgia that are providing local warning in the regions.
therese.buergi@bafu.admin.ch				IFKIS-Hydro is a system where real-time monitoring and model results are combined on an common platform. The platform GIN will detach IFKIS-Hydro within the next years. Interfaces to a common flood warning system covering all models operated in Switzerland is in discussion



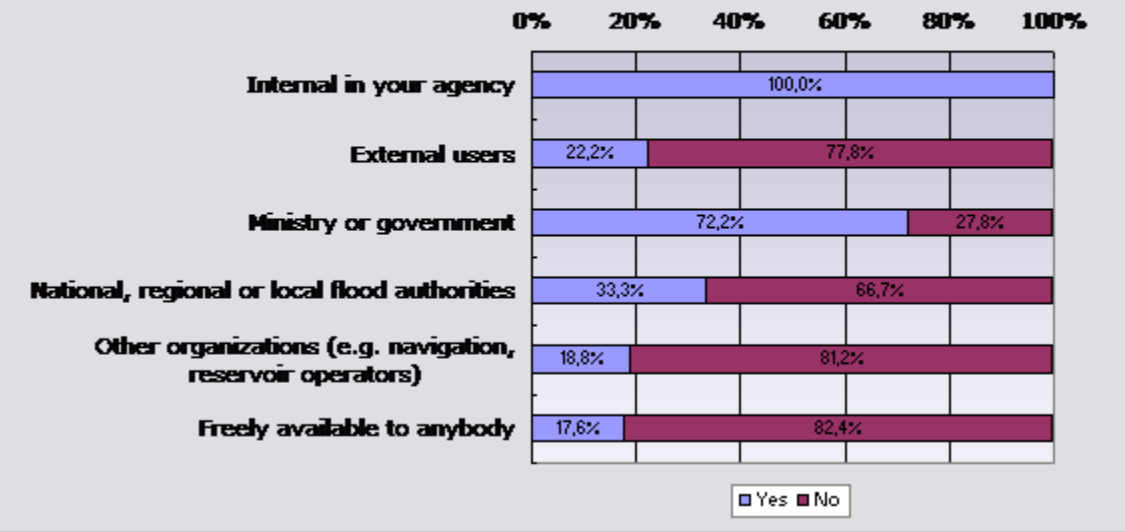
	Yes	No	Respondents	No response
Do you verify/evaluate your real-time hydrological forecast and warnings?	86,4%	13,6%	22	4
Regularly	61,1%	38,9%	18	8
After the flood event	89,5%	10,5%	19	7



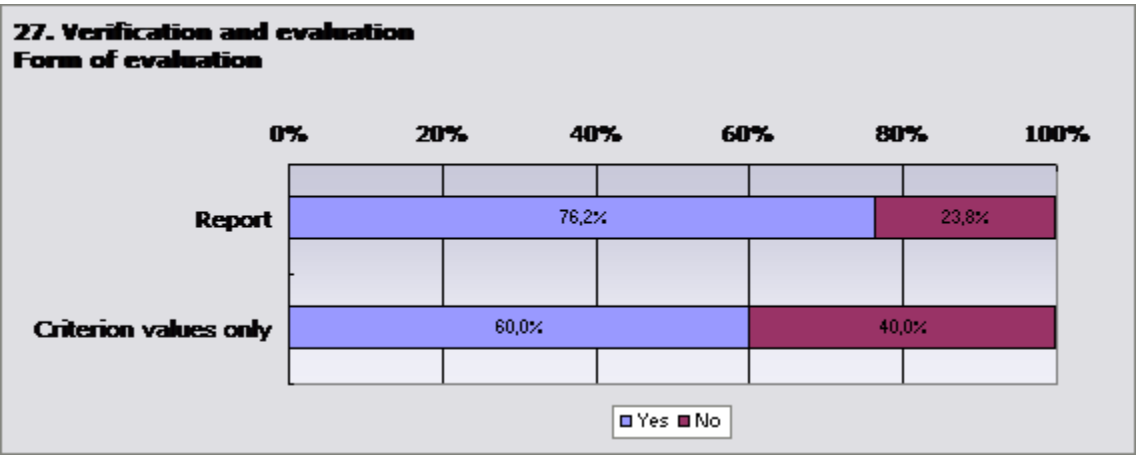
	Yes	No	Respondents	No response
Subjective (e.g. visual control)	86,4%	13,6%	22	4
Objective (statistical criteria, please specify what criteria do you use in comment field)	78,9%	21,1%	19	7

Email	First name	Last name	Info	Comments
anc@ceh.ac.uk				Hydrological data is quality assured.
auguliene@meteo.lt				We use data of hydrometeorological stations
bedr@mecom.ru				The common criteria corresponding to the WMOs Technical Regulations
bogdan.ozga-zielinski@imgw.pl				Standardized forecast error, effectiveness coefficient, etc.
danelka@chmi.cz				Nash-Sutcliffe, and comparison to persistent forecast
daniela.kyselova@shmu.sk				statistical criteria - comparison of issued forecasts and real data
director@hnms.gr				Deterministic and probabilistic statistical evaluation of the forecasted precipitation amounts e.g. POD, FAR, Brier Score
markku.puupponen@ymparisto.fi				Inflow volume error in % and m3
therese.buergi@bafu.admin.ch				<p>Re question 24 and 25: in all points the answer no reflects the current status. At the time being verification tools for post-flood and regularly verification are set up. In a first step forecasts from our participation in the MAP D-PHASE project are evaluated. The tool will be enhanced for operational use.</p> <p>Criteria are mainly from  <a href="http://www.bom.gov.au/bmrc/wefor/staff/eee/verif/verif_web_page.html">http://www.bom.gov.au/bmrc/wefor/staff/eee/verif/verif_web_page.html</a> + additional hydrological measures (compare with e.g.  <a href="http://www.meted.ucar.edu/hydro/verification/intro/index.htm">http://www.meted.ucar.edu/hydro/verification/intro/index.htm</a>)</p>

**26. Verification and evaluation**  
**To whom do you report the evaluation outputs?**



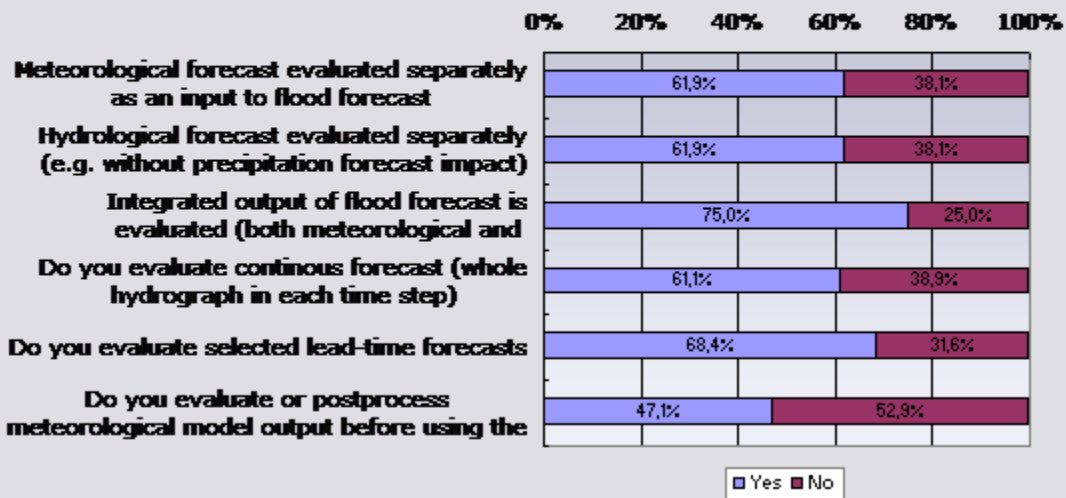
	Yes	No	Respondents	No response
Internal in your agency	100,0%	0,0%	21	5
External users	22,2%	77,8%	18	8
Ministry or government	72,2%	27,8%	18	8
National, regional or local flood authorities	33,3%	66,7%	18	8
Other organizations (e.g. navigation, reservoir operators)	18,8%	81,2%	16	10
Freely available to anybody	17,6%	82,4%	17	9



	Yes	No	Respondents	No response
Report	76,2%	23,8%	21	5
Criterion values only	60,0%	40,0%	15	11

**28. Verification and evaluation**

**Do you evaluate the performance of the whole flood forecasting process?**



	Yes	No	Respondents	No response
Meteorological forecast evaluated separately as an input to flood forecast	61,9%	38,1%	21	5
Hydrological forecast evaluated separately (e.g. without precipitation forecast impact)	61,9%	38,1%	21	5
Integrated output of flood forecast is evaluated (both meteorological and hydrological)	75,0%	25,0%	20	6
Do you evaluate continuous forecast (whole hydrograph in each time step)	61,1%	38,9%	18	8
Do you evaluate selected lead-time forecasts	68,4%	31,6%	19	7
Do you evaluate or post process meteorological model output before using the data for flood forecasting	47,1%	52,9%	17	9

Email	First name	Last name	Info	Comments and remarks
anc@ceh.ac.uk				Meteorological data is provided by a third party (the Met Office) who undertake post-processing and evaluation prior to releasing the data.
danelka@chmi.cz				Continuous forecast evaluated visually only. Large evaluation only after floods, other cases criterion only
therese.buergi@bafu.admin.ch				answers to question 27 and 28 reflects our plans for the future, not the actual state

## 29. Forecasting products and dissemination systems.

### What are the strengths of your present forecasting system?

Email	First name	Last name	Info	Response
anc@ceh.ac.uk				The current system is the National Flood Forecasting System. This is a robust system that allows the continuous inputs of real-time hydrological and meteorological data, runs the data through rainfall-runoff, hydrodynamic or routing models attached to the system, allows the running of what-if scenarios so input data can be adjusted and produces both read-only outputs for data users and outputs that can be manipulated by forecasters. The system includes both fluvial and tidal data, and provides the means to view data in spatial or stage/discharge format. This system successfully ran, without fault, during the 2007 summer floods in England.
armstate@meteo.am				experts
bedr@mecom.ru				We have various systems for various hydrological processes forecasting (ice forecasts, flash floods forecasting, hydrological forecasts for water resources management, etc.)
bogdan.ozga-zielinski@imgw.pl				Reliability for main streams concerned by experience in operational using
charles.galdies@maltairport.com				Availability of a doppler weather radar
cs@dmj.dk				The new 3-D dynamic model is pretty good for the inner Danish Waters, North sea area is very good
danelka@chmi.cz				Complete coverage, continuous development based on our suggestions, experienced users (hydrologists)
daniela.kyselova@shmu.sk				Joint hydrometeorological service, sufficient monitoring telemetric hydrological stations, Flood-Protection Act
director@hnms.gr				Strengths are those that generally characterize atmospheric models and forecasting systems
gunlog.wennerberg@smhi.se				automatic model runs update the hydrological model against the last observation
inita.stikute@meteo.lv				HBV model
jaan.saar@emhi.ee				It is based on ECMWF model and our local HIRLAM model

karl-heinz.daamen@lfu.bayern.de			Sound measurement network, reliable and fast data processing, redundancy of critical components, high up-to-dateness, robust flood forecast models, backfall solutions, informative webpage, good co-operation with neighbouring services and weather service, much of development (forecast model, data processing, webpage) is done by ourselves i.e. customised to our needs
markku.puupponen@ymparisto.fi			Full country coverage, 7days/24 h
moj@nve.no			Quality of flood forecasters and the surrounding system
piet.warmerdam@wur.nl			robustness automatically
ramazchitanava@rambler.ru			The personnel fully engaged by forecasting are 12 persons (without observers). They are using PCs (Pentium 4) 6 sets.
reinhold.godina@lebensministerium.at			A good cooperation with the national meteorological service. A sufficient density of real-time measuring points.
teresa.abrantes@meteo.pt			The good liaison and cooperation between the Civil Protection Service with the Meteorological Authority (IM) and the Water Authority (Water Institute)
therese.buergi@bafu.admin.ch			<ul style="list-style-type: none"> <li>'- good cooperation between met service and hydrological forecasting service</li> <li>- good perspectives for further development</li> <li>--&gt; additional manpower und funding for projects after flood in 2005</li> <li>- excellent availability of real time meteo and hydro data</li> <li>- very good forecasting tool (DelftFEWS)</li> </ul>

### 30. Forecasting products and dissemination systems.

#### What are the weaknesses of your present forecasting system?

Email	First name	Last name	Info	Response
anc@ceh.ac.uk				It will need to increase in capacity to allow for the use of probabilistic forecasting.
armstate@meteo.am				The lack of stat of art models
auguliene@meteo.lt				There is a lack of data in a real time
bedr@mecom.ru				We have various systems for various hydrological processes forecasting (ice forecasts, flash floods forecasting, hydrological forecasts for water resources management, etc.)
bogdan.ozga-zielinski@imgw.pl				lack of analysis of uncertainty, no ensemble forecasts
charles.galdies@maltairport.com				No flood modelling, no high resolution conceptual models for precipitation
cs@dmi.dk				No estimation of the uncertainty in the forecast
danelka@chmi.cz				Not easy backup of regional offices, no probabilities - but under development.
daniela.kyselova@shmu.sk				IT, IS, operative database - long time of developing, insufficient rain gage telemetric monitoring
director@hnms.gr				Weaknesses are those that generally characterize atmospheric models and forecasting systems
gunlog.wennerberg@smhi.se				need for more real time reporting Q/W station for running automatic forecasts
inita.stikute@meteo.lv				Systems are not particularly completed
jaan.saar@emhi.ee				There to many different media and internet sites and public don't know which of them is from our institute
karl-heinz.daamen@lfu.bayern.de				Uncertainty of forecasts, public awareness of uncertainty is not sufficient, forecasting during floods is very different from routine forecasting due to e.g. public interest and pressure of expectations, temporal constraints and public relations and cannot really be trained
markku.puupponen@ymparisto.fi				(inaccuracy now and then), too difficult for public
moj@nve.no				Meteorological input (uncertainty increases with lead time, uncertainty in spatial representation and amount, time resolution
piet.warmerdam@wur.nl				translation of point measurements into basin data
ramazchitanava@rambler.ru				Not fully automatic systems for forecasting and warnings that are foreseen to be installed in 2008.
reinhold.godina@lebensministerium.at				In Austria there are different models. A uniform representation and publication of the prognosis results are missing. Also personnel resources for a better evaluation are missing.

teresa.abrantes@meteo.pt			Uncertainties of the forecast not yet implemented
therese.buergi@bafu.admin.ch			<ul style="list-style-type: none"> <li>'- not enough manpower (is improved now), subsequently our service has potential for improvement at the moment. Fortunately we have the possibility for more projects now!</li> <li>- Spatial resolution of model has to be improved</li> <li>- products have to be optimized</li> <li>- data from hydro power plants not available</li> <li>- forecasting system covers only part of Switzerland. efforts are undertaken now in order to harmonize all systems running at the moment</li> </ul>

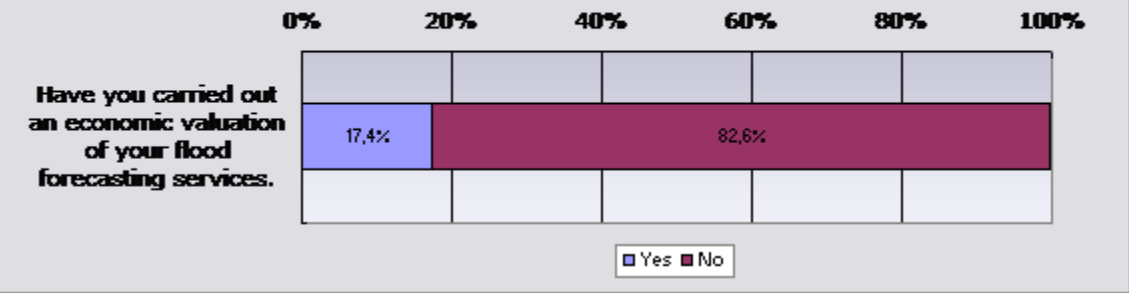
### 31. Forecasting products and dissemination systems.

**Have you specified development projects/research activities in the field of flood forecasting which may benefit from partnership with other NHSs from the region**

Email	First name	Last name	Info	Response
anc@ceh.ac.uk				No currently.
armstate@meteo.am				No
auguliene@meteo.lt				We are preparing a study of opportunities, financed by European economical space and Norway financial device.
bedr@mecom.ru				With the NHS of the republic of Belarus
bogdan.ozga-zielinski@imgw.pl				No
charles.galdies@maltairport.com				No but I am very interested to initiate this cooperation
cs@dmi.dk				The operational model is BSHcmod, which is developed by Bundesamt für Seeschifffahrt und Hydrographie, Germany
danhelka@chmi.cz				Major project inc. Flash flood tools and probability approach (national research). Common forecasting system (CZ, A, SK) Morava river.
daniela.kyselova@shmu.sk				POVAPSYS project - Flood warning and forecasting system of the Slovak republic, MOSES project, FLOODMED project
director@hnms.gr				The National Observatory of Athens-Greece participates to the FLASH project - Program of the EU. There is also in force an agreement on meteorological data sharing between the HNMS and the WS Atkins International Ltd about meteorological data supply aiming to the development of European Flood Geographic Information System on the catchment area of the trans- boundary Strymona river
gunlog.wennerberg@smhi.se				development of hydrological probability forecasts
inita.stikute@meteo.lv				yes
jaan.saar@emhi.ee				No
karl-heinz.daamen@lfu.bayern.de				Yes, we have a co-operation concerning the development of our hydrological flood forecasting model with several national and international hydrological services
markku.puupponen@ymparisto.fi				use of meteorological forecasts, weather radar precipitation, satellite snow and soil moisture, accuracy evaluation criteria and methods
moj@nve.no				Development of new forecasting system influenced by experience from NHS in neighbour countries
ramazchitanava@rambler.ru				Yes. E.g. WB implements the project that foresees installation fully automatic system for flood forecasting from Niderland.

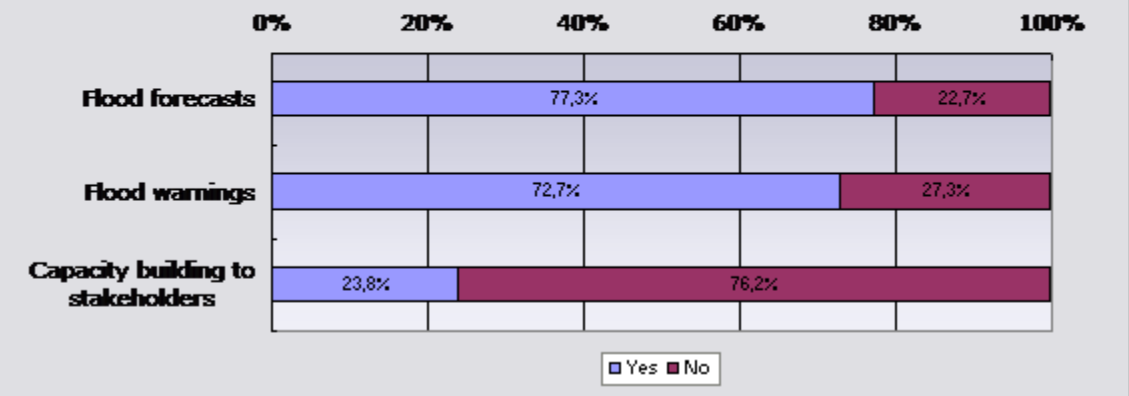
reinhold.godina@lebensministerium.at			In Austria different models are used. The models are specifically developed for the catchments area. The general experiences with this development could be interesting for others.
teresa.abrantes@meteo.pt			The harmonization of the limits of heavy precipitation to issue the different levels of warnings (yellow, orange and red)
therese.buergi@bafu.admin.ch			<p>'- results / experiences from MAP D-PHASE will be integrated in the operational service. Especially the training of end users with regard to the handling of uncertainty and multi-model forecasts is of importance for us. How do other NHS:s deal with this issue?</p> <p>- A big issue from my point of view is the development of standard operating procedures. A part of this process is specific for every organisation, in other areas the wheel does not have to be reinvented again...</p>

**32. Economical and legal aspects.**



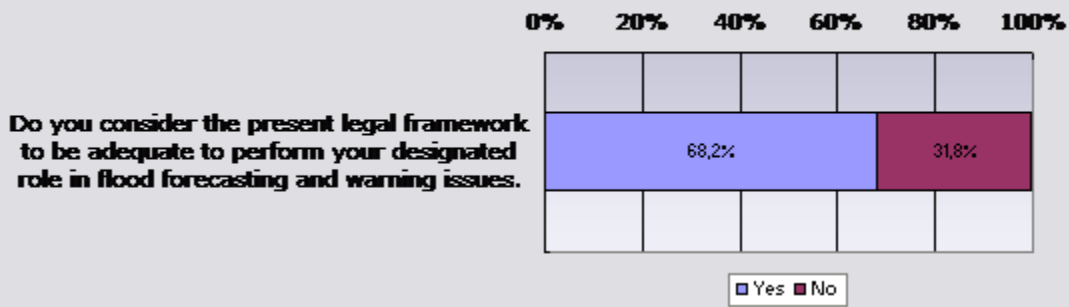
	Yes	No	Respondents	No response
Have you carried out an economic valuation of your flood forecasting services?	17,4%	82,6%	23	3

**33. Economical and legal aspects.**  
**There is a specific legal mandate for your service to provide.**



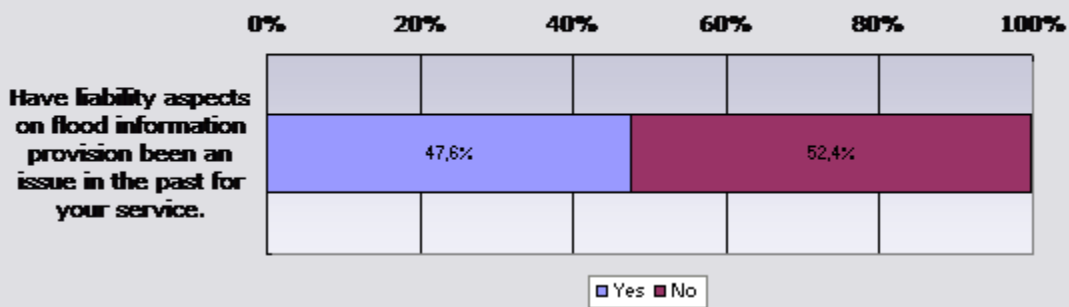
	Yes	No	Respondents	No response
Flood forecasts	77,3%	22,7%	22	4
Flood warnings	72,7%	27,3%	22	4
Capacity building to stakeholders	23,8%	76,2%	21	5

**34. Economical and legal aspects.**



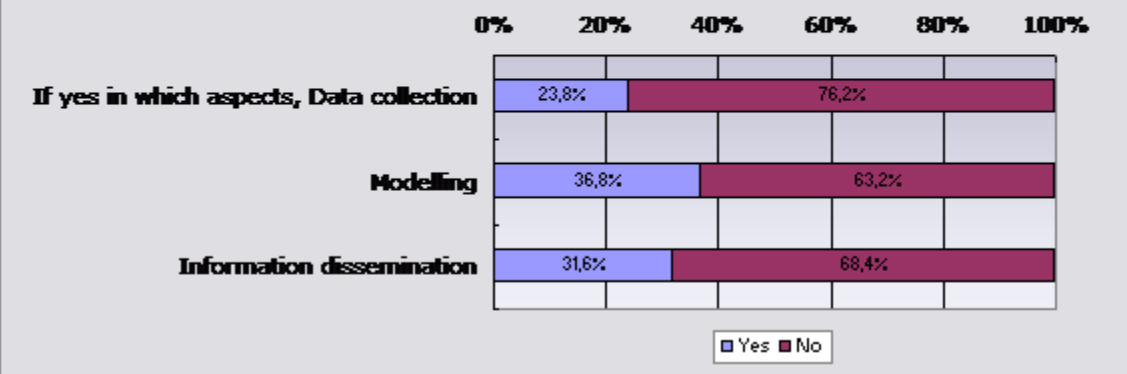
	Yes	No	Respondents	No response
Do you consider the present legal framework to be adequate to perform your designated role in flood forecasting and warning issues?	68,2%	31,8%	22	4

**35. Economical and legal aspects.**



	Yes	No	Respondents	No response
Have liability aspects on flood information provision been an issue in the past for your service?	47,6%	52,4%	21	5

**36. Economical and legal aspects.  
Is private sector competition an issue in some aspects of flood forecasting and warning?**



	Yes	No	Respondents	No response
If yes in which aspects, Data collection	23,8%	76,2%	21	5
Modelling	36,8%	63,2%	19	7
Information dissemination	31,6%	68,4%	19	7

### 37. Other comments?

Email	First name	Last name	Info	Response
anc@ceh.ac.uk				The information provide relates to the flood warning and forecasting service provided by the Environment Agency of England and Wales. This questionnaire was completed by Jacqui Cotton - Principle Scientist in the Flood Risk Science team at the EA.
charles.galdies@maltaairport.com				I would be interested to discuss the improvement of our capability with other NHMS. Charles Galdies Manager, PR of Malta with WMO
daniela.kyselova@shmu.sk				The flood warning and forecasting system of Slovak republic (POVAPSYS) is being built by Slovak Hydrometeorological Institute. Particular parts of the system (terrestrial telemetric network, distance observation systems, communication network, telecommunication computer, operative database, forecasting models) were and are carried out individually. Any further development, integration of particular systems, presentation and distribution of results, depends also on European funds' resources allocation.
jaan.saar@emhi.ee				All answers are really about coastal warnings. There has not been any serious river flooding.
ramazchitanava@rambler.ru				The NMHS of Georgia needs modern technology for hydrological data processing as well as acknowledgment with modern forecasting and early warning systems that would be done in frames of strategic planning in frames of RA VI
teresa.abrantes@meteo.pt				Suggestion: to send this questionnaire to the Portuguese Authority on flood forecasting - the Water Institute: person of contact: rrr@inag.pt and rui.rodriques@inag.pt
therese.buergi@bafu.admin.ch				re question 33 & 34: the legal basis is improved at the moment, including the legal establishment of single official voice