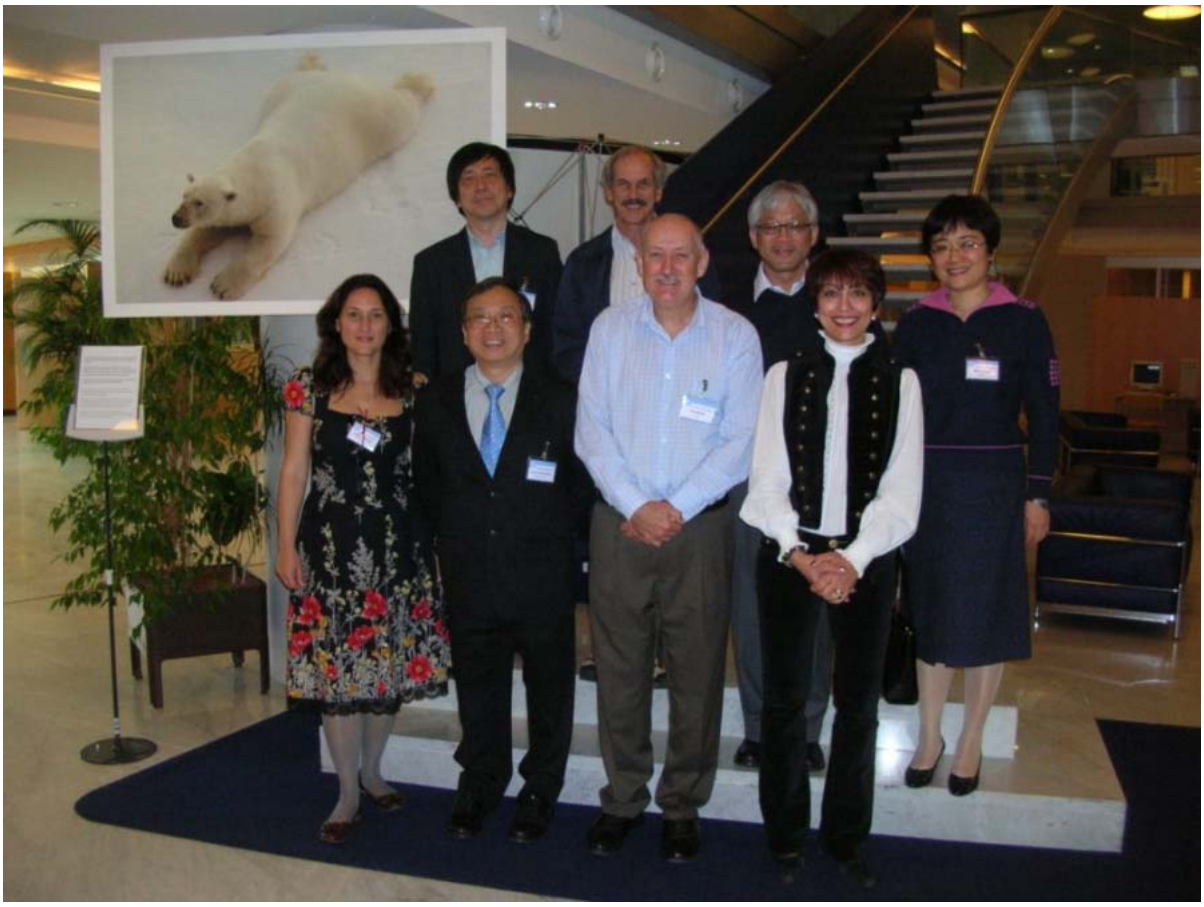
WORLD METEOROLOGICAL ORGANIZATION

Report of First Meeting of

JOint Nowcasting Applications & Services (JONAS) Steering Committee

Geneva, Switzerland, 18-20 April 2007



FINAL REPORT

Report of First Meeting of
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Opening of the Meeting

1. The first meeting of the Joint Nowcasting Applications and Services Steering Committee was opened on the morning of 18 April 2007 at the Headquarters of WMO Secretariat in Geneva.

2. In his opening remarks, Professor Hong Yan, the WMO Deputy Secretary-General, declared his pleasure at the fact that the joint steering committee between the PWS Programme and WWRP was a collaborative effort to provide a transition from the work of the scientific research community to operational applications and service delivery. He stated that the final aim of the Public Weather Services Programme, in this connection, was the application of nowcasting technology, targeted mainly to developing countries in support of safety of life and protection of property.

3. Professor Hong Yan put special emphasis on training and the development of a truly end-to-end system in the forecast process. In his opinion, interaction with end users in the development of this process was essential, as was assessing the effectiveness of the nowcast process through incorporation of social, societal and economic impact studies. He said that to be useful, complex scientific and technical concepts of nowcasting needed to be translated to simple advice and this required extensive training for both the forecasters and the users of the information through applying a high degree of communication skill so as to be able to provide the warnings in a user-friendly and understandable way, and thus increase the effectiveness of the PWS products.

PWS Nowcasting Applications Framework

4. The PWS Workshop on Warnings of Real-time Hazards by Using Nowcasting Technology held in Sydney on 9-13 Oct 2006 (hereafter called the Sydney Workshop) has drawn up a draft business plan for a PWS Nowcasting Applications framework. The current meeting was a follow-up of the Sydney Workshop to consider the development of a Joint PWSP-WWRP Nowcasting Applications Implementation Plan. The meeting was co-chaired by the co-chairs of the Sydney Workshop. The list of the participants is included in Appendix A.

5. The meeting discussed and adopted the Sydney Workshop Framework which aimed to: (i) identify gaps and needs of PWS nowcasting services; (ii) promote new and existing possibilities for maximizing the end-to-end application of nowcasting systems within PWS; (iii) facilitate the generation of new or improved PWS products for the benefit of community; and (iv) undertake capacity building to promote the transfer of relevant nowcasting processes and technology, in particular from developed to developing countries. The meeting also considered that an appropriate mission would be to “increase the capacity of NMHSs to deliver reliable nowcasts to enable informed decision-making in mitigating the effects of high impact weather and weather-related disasters.”

6. After analyzing the processes of nowcasting applications and services, the meeting recognized that the challenges faced in nowcasting applications and services were more than just forecasting and technical issues. The following major challenges were identified:

(i) specific nowcast applications supported by operational nowcasting systems with high degrees of automation, minimal checking and timely value-added processing tasks by forecasters;

(ii) telecommunication infrastructure for relay of reliable, timely and consistent nowcast products;

(iii) public or users' readiness and preparedness to digest nowcast products and information meaningfully; and

(iv) having processes, expertise and linkages that can adapt, modify and optimize the information content and utility of products and services, and quantify the associated benefits of the information.

7. To meet these challenges, efficient and effective interaction with the user community would be essential. The consensus was that a JOint Nowcasting Applications and Services (JONAS) Steering Committee comprising experts from both the WWRP and PWSP should be established to oversee the Implementation Plan mentioned above.

8. The meeting discussed the role of the forecaster in the service delivery chain and recommended that a balance should be struck between the need to deliver the nowcast information quickly and the need to ensure information consistency. Although the electronic media would be a potential asset in rapid nowcast service delivery, the meeting considered that care should be taken to uphold the authority of the NMHSs as the "single-voice" in the provision of forecasts and warnings.

9. The meeting also reckoned that a collaborative medium would need to be established through which nowcasting system designers, operational forecasters, PWS product developers, disaster managers and users can readily interact and explore optimal ways forward. In the discussion about the scope covered by WWRP-NWG and PWS, the meeting recognized that from R&D to service delivery, there are areas of overlap where the two groups should naturally interact and develop joint activities in the form of test beds, FDP etc.

10. The meeting agreed on the following Terms of Reference (ToRs) and composition for the JONAS Steering Committee:

(i) to facilitate the identification of user needs and the engagement of users for nowcast applications in PWS;

(ii) to promote the operational use of end-to-end nowcasting techniques, processes and systems as a critical component in an effective PWS framework with emphasis on DPM applications and decision-making by users;

(iii) to provide guidance material on nowcasting applications in PWS, including establishing an inventory of existing operational nowcasting tools, processes and capabilities;

(iv) to provide recommendations to PWSP on the endorsement and priority of projects that: (a) promote and enhance capability for end-to-end nowcasting activities; (b) undertake capacity building activities for transferring technologies to developing and emerging nations; (c) facilitate regional multi-national collaboration, demonstration projects and other initiatives;

(v) to provide a link between PWSP and WWRP, and to liaise with other related WMO programmes as appropriate;

(vi) to report to PWSP and WWRP the progress made in projects and the use of nowcasting products among WMO Members; and

(vii) to facilitate the assessment of the societal and economic benefits of nowcasting applications in PWS.

11. The JONAS Steering Committee would comprise:

(i) nowcasting expert to be appointed by WWRP as Co-Chair;

(ii) PWS/DPM expert to be appointed by PWSP as Co-Chair;

(iii) CBS representative in WWRP Nowcasting Working Group;

(iv) forecast systems expert;

(v) PWS expert from developing countries;

(vi) advisors and experts, e.g. (potential) hosts of Open Laboratory or Test Bed, to be invited as required; and

(vii) WMO Secretariat representative.

Components for PWS Nowcasting Service Delivery

12. On end user requirements, the meeting reckoned that:

(i) In view of the different needs in different regions, an effective nowcasting service delivery process would have to cater for different specialized requirements in nowcast applications (e.g. flash flood over certain catchment or river basin, QPE or QPF for different durations, visibility, icing conditions, turbulence, wind, temperature, humidity, smog, severe weather, etc).

(ii) The focus should not always be on “extreme” events, as it should be recognized that the impact would be just as keenly felt if certain weather conditions occur at the wrong time and in the wrong place.

(iii) Possible flip-flop nature of nowcasting guidance could sometimes confuse the uninitiated users and attention should be given to how such information could be intelligently and coherently presented for the maximum benefits. Development of probabilistic approaches might serve the users better.

(iv) There would also be a need to educate users on how to interpret and best utilize the nowcast information provided, and this often would require a sustained engagement effort over a period of time to allow interactive and iterative processes to take effect.

(v) As the best nowcast guidance would be meaningless if not effectively used, there would be a need to target specific user groups, understand, and mutually adapt nowcast products to decision-making processes to fully engage them in reaping benefits from advances in nowcasting technologies and products. Attempts should be made to: (a) link up with relevant WMO

initiatives to develop and demonstrate the usefulness of nowcasting products and service; and (b) organize joint workshops between WWRP and PWSP with regional emphasis and end-user specialized themes.

(vi) Potential user groups could include hydrologists, disaster managers, aviation industry, transport operators, construction industry, energy sectors, public utility operators, tourism industry, sporting events, marine activities, media and IT services providers. Some such as hydrologists, media or IT groups could be considered as partners as well in the service delivery process.

(vii) According to the recent DPM survey undertaken by PWS ET/DPM, rain-related hazards were the main concern. In focusing on specific priority areas to launch nowcasting initiatives, it would also be important to match DPM needs against more pragmatic considerations such as available user groups that can be readily reached out and available technology offered by nowcasting systems currently in operation. On that basis, the general consensus was to start with nowcasting applications for rain-related events. This should not preclude the development of applications for other weather elements such as visibility, temperature, etc.

(viii) While the conventional way was to design nowcasting systems with links to warning criteria or thresholds, it would be important to retain certain flexibility in the system interface to allow forecasters or users to set alternative critical alert levels in accordance with the needs of different users, industry and decision-making requirements (e.g. different temperature requirements for making chocolate and ice-cream!)

13. On service delivery, the meeting agreed that:

(i) Products would need to be “pushed” to appropriate user technologies (radio, TV, internet, cell phone, text messages, flags on poles, word of mouth). Some nowcasting information that was precise in time (minutes) and space (km) might not be appropriate to the broad community. Communication technologies that target specific end-users need to be considered and products “in the language” of the end-user need to be developed.

(ii) Considering the infancy of nowcasting information in end user decision-making processes, the short temporal applicability and related small spatial scale of nowcasting information data or products, the changing nature of the environment, development of “pull” technologies for accessing a nowcast weather database should be developed and considered.

(iii) While IT advances in recent years had opened up new possibilities in rapid and timely dissemination of nowcast information, electronic media and mobile devices might become unreliable or even unsafe to use in events such as severe thunderstorms, typhoons, lightning storms, etc. In developing countries, adequate telecommunications might not be available particularly in rural economies. As such, it would be important to maintain a diversified delivery approach through a multitude of information channels (sirens, signal flags, internet, cell phone, etc).

(iv) Noting that the new WMO Information System would include features that enable nowcasting information and products to be effectively disseminated through real-time push as well as on-demand pull through the Internet, contact should be established with the relevant commission(s) to include

nowcasting information exchange requirements in design specifications such as the metadata profile. The Common Alerting Protocol project to facilitate exchange of warnings should be monitored as a future delivery mechanism.

(v) In the course of service delivery, it would be just as important to ensure that real time access to data and observations could be maintained for quality input to the nowcasting systems.

(vi) In assessing the impact of services, in terms of system performance, forecast verification as well as societal/economic benefits, the experience of and methodologies used in S2K, B08FDP, Thorpex and V10 should be collated and documented through its respective working groups for future reference. As this was still a new and emerging research area, challenges remained particularly in the area of nowcasting. Creation of specific projects to quantify the societal impacts of nowcasting in a variety of situations should be considered.

14. The meeting considered it important to engage end users and stakeholders in developing and assessing service impact and effectiveness. It recommended that relevant PWS technical documents and guidelines should be reviewed or updated as necessary to ensure issues relevant to nowcasting products and services were suitably addressed. It envisioned that future focus groups should be considered to engage “early adopter” end users to understand leverage and key points in their decision making process in order to provide guidance to the development of nowcast products and their timely delivery. Establishing multi-year test beds would allow end-users to properly assess, evaluate and adapt their decision-making processes to nowcasting products.

15. The meeting noted that recent meteorological data processing and forecaster workstations were being designed with product consistency and nowcasting delivery concept, such as (i) the Thunderstorm Interactive Forecast System (TIFS, BoM/Australia) allowing the forecaster to modify erroneous thunderstorm cell tracks and to automatically generate a variety of end user products, both text and graphics, related to convective severe thunderstorm warnings, (ii) the NinJo workstation (DWD/DMI/MCH/NSC) - a modern forecaster workstation modeled after the Forecast Production Assistant software and the Météo-France Object based warning system would allow the forecaster to maintain a man-machine modified weather object database, from which the full spectrum of nowcast and weather warnings and products could be automatically generated and (iii) the Integrated Forecaster Database (US NWS) that provides a gridded data base. These represent different implementations of the same “weather in the box” concept from which products can be generated in a consistent fashion. However, it was noted that these kinds of workstations would not be readily available to developing countries and least developing countries. Nevertheless, the meeting opined that such systems should be considered for inclusion in any nowcasting initiative to test and evaluate the potential for mass production and delivery of specific nowcasting products to a wide variety of users.

16. The meeting also noted that EUMETSAT had taken a significant lead in the provision of the MSG data and products to developing countries in Africa through the provision of the PUMA workstation and through product development and training. EUMETSAT should be encouraged to provide the SAF Nowcasting outputs (although to adapt the algorithms might require further research as a significant gap was identified at the recent Maputo MSG User Meeting related in the use of MSG products for nowcasting). While users were familiar with the products, their interpretation and usage in rapidly changing environments for nowcasting and warnings could be improved. This was also an identified gap during the development of the RSA Nowcasting Training Workshop (Nov 2005). The interaction and engagement of the nowcasting experts (particularly conceptual model, radar and satellite warning experts) and

the MSG experts was highly encouraged to develop “usage” warning training guide and workshops.

17. The meeting agreed that as precipitation had been consistently identified as the major nowcast parameter, quantitative precipitation estimation from radar and satellite should form the core of nowcasting services. Recent radar research developments had significantly reduced the error in rainfall estimates. Data and signal processing technology and data/product quality estimates would need to be extended to radar networks throughout the world. It was noted that a WMO Radar QC/QPE Inter-comparison (RQQI) project was being formulated under CIMO/WWRP/WCRP and its inclusion in any demonstration projects or test beds would be mutually beneficial. Satellite based QPE should also be encouraged since this is a readily available data source in developing countries. The meeting observed that for some developing countries where radars were not available and surface observations were scarce, a good precipitation estimate could be obtained from MSG provided that those countries were under the MSG footprint.

18. It was observed that a significant element of the nowcasting service would be the role of the human forecaster in the decision-making process. Decision-making in a rapidly changing weather situation was highly stressful and forecast systems should be encouraged and developed to enhance this valuable resource. An example is the CARDS system Meteorological Service Canada (MSC), where automated algorithms were used as leverage points to multi-panel product displays for quick and informed decision-making by the forecaster. Another example is the Autonowcaster where fuzzy logic interest fields can be displayed which show the contributing factors to the automated guidance. This should be coupled with usage and forecast process training (not just functionality training) through weather event simulations to hone the decision-making skills of the forecaster. This is a crucial and basic component to enhancing the nowcast service. A successful example of such a program is the Warning Decision Training Branch of the National Severe Storms Lab/NOAA. To enhance the relevancy, the simulations should be conducted with data from the appropriate forecast domain.

19. The meeting noted the success of the CBS – Severe Weather Forecast Demonstration Project in Southern Africa (CBS-SWFDP) which served as a good example of capacity building in developing countries in an operational environment and the need to address the application of warnings to disaster managers and the communities at risk. Another deficiency identified by the SWFDP was the need for nowcasting capabilities in these countries. While similar projects on nowcasting applications merited further consideration, the meeting recommended that the use of MSG data be explored for potential FDPs in view of the general lack of radar infrastructure in the region.

20. The meeting noted that nowcasting was an area of rapid change that used sophisticated technologies (e.g. radar networks in developed countries, new radars with polarization capability, multi-spectral MSG, sophisticated digital processing techniques, high resolution NWP and radar data assimilation). However, communities vulnerable to high impact weather were often located in developing countries without these technologies. Demonstration projects on nowcasting applications in PWS in these developing countries taking into account existing infrastructure issues should be highly encouraged.

Building on Existing Initiatives and Identifying New Opportunities

21. The meeting agreed to establish pilot projects of test beds on a regional basis for showcasing, integration with end-user applications and demonstrating the usefulness of nowcasting applications and services. The definition of a “test bed” was adopted as: “Working relationship in a quasi-operational framework among measurement specialists, forecasters, researchers, private sector and government agencies, aimed at solving

operational and practical regional problems with a strong connection with the end users. Outcomes from a test bed are more effective observing and processing systems, better use of data in forecasts, improved services and products, and economic as well as public safety benefits. Test beds accelerate the translation of research findings into better operational services and decision-making. A successful test bed requires physical assets, as well as substantial commitment and partnership."

22. As such, the objective of the test bed pilot projects would be to provide a quasi-operational environment for demonstrating and evaluating nowcasting technology in the detection, monitoring and prediction of high-impact weather phenomena aimed at solving operational and practical problems, with active participation of experts as well as end users. Such test beds which would be open to Members, in particular developing countries with a long-term outlook, could provide assistance in developing and upgrading skills or competence. These test beds would also be open to end-users to integrate and mutually adapt nowcast products in their decision-making processes. These open test beds would have to meet the following requirements:

(i) physical location to host the necessary computer facilities;

(ii) sufficient computing resources with proven capabilities, reliability and robustness to run the nowcasting system(s) and facilities to support the test bed activities;

(iii) operational nowcasting systems with real-time data access;

(iv) necessary scientific expertise to: (a) understand the nowcasting applications, and (b) use the nowcasting applications in the nowcast process;

(v) implement the strategies and objectives established by the JONAS SC;

(vi) provide documentation and report on the use of the systems;

(vii) compile verification data, techniques and computation of statistics;

(viii) archive and replay of cases for review and study;

(ix) host training workshops, visits and seminars; and

(x) provide and maintain hosting capability for a period of at least 3 to 5 years.

23. In offering to host an open test-bed, the host would have to consider the following issues:

(i) resources (personnel, time, funding);

(ii) documentation and language barriers;

(iii) ongoing system support; and

(iv) liability and accountability.

24. In return, the test bed host could benefit from the following positive impacts:

(i) visit, contribution and involvement of experts to address regional and local issues;

(ii) extended evaluation and more meaningful inter-comparison of nowcast systems based on more study cases;

(iii) evaluation of normal data mode (i.e. without intensive observations) and system support modes;

(iv) development of training material directed to specific regional and local cases;

(v) continued training of forecasters and accumulation of operational experiences;

(vi) customization and refinement of nowcasting applications for local needs;

(vii) enhanced visibility and exposure;

(viii) effective exchange of ideas and contribution to the WMO mission through international co-operations;

(ix) development of products based on integration of nowcast systems (e.g. ensemble nowcast guidance)

(x) engagement of end-users in the planning, operation and evaluation of nowcast processes; and

(xi) improved operational efficiency, more products and better services.

25. Nowcasting systems eligible for the test beds should generally meet the following requirements:

(i) proven capabilities, reliability and robustness;

(ii) sufficient user guidance and documentation; and

(iii) basic technical and training support as appropriate.

26. The meeting adopted the following capacity building initiatives:

(i) training workshops, seminars and other initiatives;

(ii) partnerships, mentoring via fellowships, attachments and hosted visits;

(iii) development of a guideline on the application of nowcasting in PWS,

(iv) development of an inventory of nowcasting systems; and

(v) web links to useful nowcasting resources.

27. Piggy backing on an FDP or other high profile initiative or project (e.g. B08 FDP, World Cup Football, World Expo) would provide a target and focus to initiate the test bed in a timely manner.

Long Term Plan for Activities

28. The meeting took note of the funding opportunities under the DCR (Development Cooperation and Regional activities) Department of WMO and recognized the advantage in formulating projects with specific goals that would bring about human, social and economic benefits. These projects often involved heavy financial commitment over an extended period of say 3 to 5 years. Sponsorship arrangement involving partnership with commercial companies could also be explored under suitable conditions.

29. The meeting discussed and adopted the roadmap and time line shown in Appendix B.

30. The meeting closed at 1700 on 20 April 2007.

APPENDIX A

First Meeting of the JOint Nowcasting Applications and Services (JONAS) Steering Committee

(Geneva, Switzerland, 18-20 April 2007)

LIST OF PARTICIPANTS

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APPENDIX B

JONAS Steering Committee - Roadmap and Timeline

Item	Activity	Description	TOR	Timeline	Lead	Funding
1.	Prepare overall Strategic Plan including capacity building initiatives	How to take advantage of existing initiatives to build capacity and establish links to end users; identify low hanging fruit; includes a plan for capacity building.	iv, iv(b)	Draft 14 Sep Final 30 Oct	Wong, Keenan, with input from Stan-Sion.	Not required
2.	Develop test beds	Identify potential hosts*, requirements**, etc. Implementation plan for each test bed.***	i ,ii	* Done ** 30 Nov *** Defer	Wong, Stan-Sion, Poolman, Wang, *Augusto.*	Not required
3.	Envisioned focus group	May be part of Test Bed, "what if" workshops.	ii	Defer		Required
4.	Develop demo projects	Identify potential hosts*, requirements**, etc. Implementation plan for each demo project.***	i, ii	* Done ** 30 Nov *** Defer	Poolman, Joe.	Not required
5.	Develop operational nowcasting systems inventory	Design a template for the inventory, post on web, identify contact person; and facilitate online registry of systems by voluntary system owners.	iii	Draft 14 Sep Final 30 Oct	Lai, Kootval, Muchemi.	Not required
6.	Guide to operational nowcasting	How to nowcast lightning, thunderstorms, tornadoes, hailstorms, strong wind events, temperature, winter phenomena, etc.	iii	Outline 14 Sep Actual guide will take several years to finish	Stan-Sion, Keenan, Lai, Joe, etc.	Not required
7.	Meetings, seminars, workshops, site visits, etc	Review of proposals, planning of activities and implementation of initiatives.	iv	As required	JONAS SC	Required
8.	Link between PWSP and WWRP	Meeting in Geneva, formulate TOR for JONAS SC.	v	Done	JONAS SC	Required

9.	Summary reports	Minutes and reports as required.	vi	As required,	Wong, Keenan	Not required
10.	Identify socio-economic expert	Find mechanism to link to socio-economic groups, review and adopt B08FDP SEIA report, SEIA requirement for test bed projects.	vii	25 April 2007	Keenan	Not required