

# EVALUATION OF THE SWFDP REGIONAL SUBPROJECT IN RAI

*Jean Coiffier, Consultant*

*(revised version 09/08/2007)*

## 1 – Introduction

This paper describes the various steps and procedures whose implementation has been decided during the successive steps of the development of the SWFDP Regional Subproject in RAI (Southeastern Africa) for evaluation purposes with respect to the main goals of the SWFDP that are the following:

- to improve the ability of NMHSs to forecast severe weather events;
- to improve the lead time of alerting of these events;
- to improve interaction of NMHSs with DMCPAs before and during events;
- to identify gaps and areas for improvements;
- to improve the skill of products from GDPFS Centres through feedback from NMHSs.

These procedures aim to systematically collect relevant information and regular progress reports from the participating countries during the demonstration phase of the subproject in order to be able:

- to evaluate the skill of the various NWP products,
- to assess the pertinence of the RSMC Pretoria daily guidance,
- to evaluate the efficiency of the severe weather warnings issued by NMHSs,
- to understand the coordination between NMHSs and DMCPAs for improved communications and service delivery.

(Note: “DMCPA” – Disaster management and civil protection authorities)

## 2 – General aspects of the evaluation

The general principles of the evaluation of the SWFDP were firstly defined during the meeting of the CBS SWFDP Steering Group (Geneva, 14-16 December 2005). As the SWFDP is based on a cascading process involving several Centres, it has been recognized that regular feedback should be provided to evaluate the efficiency of the whole end-to-end process including beyond DPFS aspects to include the quality of the service delivered to DMCPAs.

According to the SWFDP Overall Project Plan, it has been proposed to undertake a complete evaluation of the project at the end of the experimentation (demonstration). To provide useful information about the efficiency of the whole cascading process, this evaluation should be considered from three points of view.

The main part of the evaluation will consist of a complete assessment about the skill of the forecasts and especially to the ability of the NMHSs to fulfil the requirements expressed by their DMCPAs. Thus, the evaluation must assess how the enhanced severe weather forecasting process of the SWFDP was able to improve on (reduce the numbers) missed cases and false alarms of severe weather. To this aim it is essential that both NMHSs and DMCPAs provide data and information for the evaluation.

This evaluation should also include an assessment on the relevance of the products exchanged among the participating GDPFS and national centres, and of the organization of the whole cascading process, including the near real-time feedback.

Finally, the evaluation of the SWFDP should identify the shortcomings and to propose improvements in order to ensure the sustainability of the cascading process organization among the selected GDPFS and national centres as well as to facilitate an extension of the system to other NMHSs of the same geographical and similar climatic region.

### 3 – How to achieve the regular feedback?

A practical way to perform regular feedback was discussed during meeting of SWFDP Regional Subproject (Pretoria, South Africa, 31 July - 3 August 2006), and the agreed arrangements are included in the SWFDP Regional Subproject Implementation Plan.

In order to be able:

- to verify the efficiency of the warnings issued by the NMHSs (comparison between the forecast and the reality each time a severe weather event is forecast or occurs,
- to assess the guidance issued by the regional Centres,
- to provide feedback from DMCPAs (impacts of the severe event, usefulness of warning bulletins),

it was proposed to use an event evaluation form (to be filled by the NMHS and transmitted to the RSMC immediately after a severe weather event, whether forecasted or observed) and to archive the products that have been used in the production of severe weather forecasts, for use in future case studies.

For the purpose of the monitoring severe weather in the region, the meeting decided that the participating NMHSs will provide RSMC Pretoria with their respective warning criteria for heavy rainfall and strong wind. RSMC Pretoria was to create a graphic to depict these thresholds on a single chart and distribute to all participating centres.

The meeting developed the presentation format of medium-range and short-range guidance issued by RSMC Pretoria, including probability and risk tables, relative to severe weather events, as well as the corresponding event evaluation form enabling the NMHSs to assess the quality of this guidance. It also agreed to indicate on this form whether the events are associated with severe convective activity. The evaluation forms are to be completed by the NMCs and sent to RSMC Pretoria, ACMAD, NCEP African Desk, Chair of SWFDP Steering Group, and WMO Secretariat. The format adopted for the various elements of the RSMC Pretoria guidance is given in Annex I to this document. The evaluation form (Excel file) is also posted on the SWFDP Web portal hosted by RSMC Pretoria (<http://www.weathersa.co.za/RSMC/login.jsp>) and is given at the Annex II to this present document.

The meeting encouraged NMHSs to develop a suitable form that facilitates feedback from their respective DMCPAs for the purpose of evaluating the warning services that are provided through the advisories and warnings bulletins or any other means of alerting them.

The global centres invited the other participating centres to provide feedback on the performance of their respective NWP products. Such feedback is not required on a daily basis however would be most useful in summary form. These summaries would be collected by RSMC Pretoria and then forwarded to the global Centres for their consideration and action.

For the purpose of project evaluation at the completion of experimentation period, the meeting stressed the importance of creating and maintaining an archive of NWP products and related information about the severe weather. The archived information could also be the basis for developing case studies for training purposes and exercising emergency procedures involving DMCPA. The meeting agreed that on a case by case basis (when a severe weather event is either observed or forecasted) all products relevant to the project

should be archived by ACMAD and RSMC Pretoria. The daily guidance products from RSMC Pretoria must also be archived. The participating NMCs are encouraged to archive relevant products and information as per local/national needs.

#### 4 – Evaluation procedures

The demonstration phase of the regional subproject commenced on 6 November 2006. On this date, RSMC Pretoria commenced issuing the new daily severe weather guidance product, while dedicated web/ftp sites have been implemented by the global products Centres; they are all accessible via a protected Web portal implemented at RSMC Pretoria. After a few months of experimentation phase of the SWFDP cascading process, participants from the centres participated at the meeting of SWFDP RA I Regional Subproject Management Team (Maputo, Mozambique, 27 February – 2 March 2007). At the midterm of the critical season for severe weather, this meeting gave the opportunity to assess the efficiency of the cascading process, the validity of the SWFDP arrangements, and the efficiency of the feedback for evaluation purpose.

During this meeting the Met. Office UK presented a paper on aspects to be considered and questions to be answered in the evaluation of the subproject, while the demonstration is ongoing, and for the final overall project evaluation. The questions were intended to assist in determining how the project is positively affecting the severe weather forecasting process to result in better forecasts and warnings as well as better warnings services. The meeting discussed this document and agreed to focus the evaluation with respect to the following four aspects:

- RSMC Pretoria daily guidance product,
- NWP products,
- Severe weather warnings issued by NMHSs,
- NMHS coordination with DMCPA, for improved communications and service delivery.

The meeting agreed that in order to be able to assess the impacts and results of the SWFDP, it is important to establish the pre-SWFDP benchmark of each NMHS's severe weather forecasting and warnings programs, i.e., before November 2006. The NMHSs agreed to prepare a description of their respective benchmarks.

The meeting agreed that all NMHSs will prepare quarterly reports on the status of the SWFDP in their respective country. (It is important to note that these reports are separate from the event evaluation forms that are required to be filled following the severe weather events, forecast or observed).The reporting periods and deadlines for reception of the reports are given in the table below:

Report No.	Months (inclusive)	Report to be received by:
1	Nov. 2006 – Feb. 2007	31 March 2007
2	Mar. 2007 – May 2007	30 June 2007
3	June 2007 – Aug. 2007	30 Sep. 2007
4	Sep. 2007 – Nov. 2007	31 Dec. 2007

The meeting agreed that each quarterly report has to include at least one case study related to a severe weather forecasting case (actual event or a forecasted event that did not occur).

In order to assist NMHSs to produce these reports, the meeting agreed on the quarterly report structure and content and developed a template which is given in the Annex III to this document.

The quarterly reports will be distributed to all members of the Regional Subproject Management Team, and the Secretariat (Mr Peter Chen). The quarterly reports will be the basis on which the overall evaluation of the project will be developed.

## **ANNEX I: Guidance provide by RSMC Pretoria**

### **RSMC-PRETORIA SWFDP GUIDANCE PRODUCTS**

#### **MEDIUM-RANGE (DAY 3, DAY 4 AND DAY 5)**

**Issue Date:**

**Valid for:**

#### **1. SYNOPSIS OF EXPECTED WEATHER PATTERNS**

1.1. DAY 3 (date)

Degree of confidence ( low, medium, high):

1.2. DAY 4 (date)

Degree of confidence ( low, medium, high):

1.3. DAY 5 (date)

Degree of confidence ( low, medium, high):

#### **2. DISCUSSION OF GUIDANCE PRODUCTS FROM GLOBAL AND REGIONAL CENTRES**

(Comments about the products that are used with reference to figures or charts included under bullet 3)

2.1. EPS PRODUCTS (ECMWF, MET OFFICE, NCEP)

ECMWF Severe Weather Index:

2.2. GLOBAL MODELS

2.3. OTHER PRODUCTS

#### **3. GRAPHICAL ADDITIONS**

(Copies of figures, charts or other graphics from EPS (and deterministic models) referred to in the discussion)

Fig 1:

Fig 2:

**RSMC-PRETORIA  
SWFDP GUIDANCE PRODUCTS  
PROBABILITY TABLES**

**MEDIUM-RANGE (DAY 3, DAY 4 AND DAY 5)**

**Issue Date:**

In order to provide more information about the geographical location of the severe event the following convention is adopted when filling in the cells: X for the whole country, N for the northern part, S for the southern part, W for the western part and E for the eastern part.

**DAY 3: (date)**

	<b>HEAVY PRECIPITATION</b> (exceeding threshold 50 mm/6 hrs)				<b>STRONG WINDS</b> (exceeding threshold 20 kts)			
	<b>&lt;10%</b>	<b>30%</b>	<b>60%</b>	<b>&gt;80%</b>	<b>&lt;10%</b>	<b>30%</b>	<b>60%</b>	<b>&gt;80%</b>
<b>Probability</b>								
<b>Botswana</b>								
<b>Madagascar</b>								
<b>Mozambique</b>								
<b>Tanzania</b>								
<b>Zimbabwe</b>								

**DAY 4: (date)**

	<b>HEAVY PRECIPITATION</b> (exceeding threshold 50 mm/6 hrs)				<b>STRONG WINDS</b> (exceeding threshold 20 kts)			
	<b>&lt;10%</b>	<b>30%</b>	<b>60%</b>	<b>&gt;80%</b>	<b>&lt;10%</b>	<b>30%</b>	<b>60%</b>	<b>&gt;80%</b>
<b>Probability</b>								
<b>Botswana</b>								
<b>Madagascar</b>								
<b>Mozambique</b>								
<b>Tanzania</b>								
<b>Zimbabwe</b>								

**DAY 5: (date)**

	<b>HEAVY PRECIPITATION</b> (exceeding threshold 50 mm/6 hrs)				<b>STRONG WINDS</b> (exceeding threshold 20 kts)			
	<b>&lt;10%</b>	<b>30%</b>	<b>60%</b>	<b>&gt;80%</b>	<b>&lt;10%</b>	<b>30%</b>	<b>60%</b>	<b>&gt;80%</b>
<b>Probability</b>								
<b>Botswana</b>								
<b>Madagascar</b>								
<b>Mozambique</b>								
<b>Tanzania</b>								
<b>Zimbabwe</b>								

**RSMC-PRETORIA  
SWFDP GUIDANCE PRODUCTS  
SHORT-RANGE (DAY 1 AND DAY 2)**

**Issue Date:**

**Valid for:**

**4. SYNOPSIS OF EXPECTED WEATHER PATTERNS**

4.1. DAY 1 (date)

Degree of confidence ( low, medium, high):

4.2. DAY 2 (date)

Degree of confidence ( low, medium, high):

**5. DISCUSSION OF GUIDANCE PRODUCTS FROM GLOBAL AND REGIONAL CENTRES**

(Comments about the products that are used with reference to figures or charts included under bullet 3)

5.1. SATELLITE IMAGES AND SYNOPTIC DATA

5.2. GLOBAL MODELS

5.3. REGIONAL MODELS (UM SA 12, UM African LAM)

5.4. EPS AND OTHER PRODUCTS

ECMWF Severe Weather Index:

**6. GRAPHICAL ADDITIONS**

(Copies of figures, charts or other graphics from deterministic models, EPS, etc referred to in the discussion)

Fig 1:

Fig 2:

**RSMC-PRETORIA  
SWFDP GUIDANCE PRODUCTS  
RISK TABLES**

**SHORT-RANGE (DAY 1 AND DAY 2)**

**Issue Date:**

In order to provide more information about the geographical location of the severe event the following convention is adopted when filling in the cells: X for the whole country, N for the northern part, S for the southern part, W for the western part and E for the eastern part.

**DAY 1: (date)**

	HEAVY PRECIPITATION				STRONG WINDS			
RISK	No risk	Low risk	Medium risk	High risk	No risk	Low risk	Medium risk	High risk
Botswana								
Madagascar								
Mozambique								
Tanzania								
Zimbabwe								

**DAY 2: (date)**

	HEAVY PRECIPITATION				STRONG WINDS			
RISK	No risk	Low risk	Medium risk	High risk	No risk	Low risk	Medium risk	High risk
Botswana								
Madagascar								
Mozambique								
Tanzania								
Zimbabwe								

## ANNEX II: Severe Weather Evaluation Form

### EVALUATION FORM (Page 1) SEVERE WEATHER EVALUATION FORM

**INSTRUCTIONS:** :

1. This form must be filled in whenever:
  - (1) Severe weather is observed (Sections A and B)
  - (2) A warning has been issued to DM/CPA (Sections A and C)
2. Email the completed document to RSMC Pretoria, WMO and other agreed recipients  
To standardize please put the title "SWFDP Evaluation Form" in the title list of the email

**A. IDENTIFICATION OF THE SEVERE EVENT**

NMHS:	<input style="width: 95%;" type="text"/>	Alphabetic	
Region affected:	<input style="width: 95%;" type="text"/>	Alphabetic	
Event Number:	<input style="width: 95%;" type="text"/>	Numeric	
Type of event:	<input style="width: 95%;" type="text"/>	Numeric	(put the right number in the cell)
1: Heavy Precipitation	(indicate the most significant phenomenon, either heavy precipitation or strong wind)		
2: Strong wind			
Severe convection	<input style="width: 95%;" type="text"/>	Numeric	(put 1 if extreme phenomena are the consequence of severe convection or 0 otherwise)

**B. SEVERE WEATHER OBSERVED (to be completed even if no severe weather has been forecast)**

		<table border="1" style="border-collapse: collapse; width: 100%;"> <tr><td style="padding: 2px;">JJ</td><td style="padding: 2px;">MM</td><td style="padding: 2px;">DD</td></tr> <tr><td style="padding: 2px;"> </td><td style="padding: 2px;"> </td><td style="padding: 2px;"> </td></tr> <tr><td style="padding: 2px;"> </td><td style="padding: 2px;"> </td><td style="padding: 2px;"> </td></tr> </table>	JJ	MM	DD							at	<table border="1" style="border-collapse: collapse; width: 100%;"> <tr><td style="padding: 2px;">HH</td><td style="padding: 2px;">MM</td></tr> <tr><td style="padding: 2px;"> </td><td style="padding: 2px;"> </td></tr> <tr><td style="padding: 2px;"> </td><td style="padding: 2px;"> </td></tr> </table>	HH	MM					UTC
JJ	MM	DD																		
HH	MM																			
Start of the event:																				
End of the event:					UTC															
Max. observed value:	<input style="width: 95%;" type="text"/>	<input style="width: 95%;" type="text"/>	Unit																	
	Numeric	Alphabetic																		

(According to the event: accumulated precipitation or gusts)

**Information from the end-users**

short text explaining the consequences and possibly some figures  
(number of interventions, casualties, damages, usefulness of the warning )

EVALUATION FORM (Page 2)

**C. SEVERE WEATHER FORECAST (to be completed even if severe weather did not occur)**

Time of the warning	toward DMCPA	<table border="1"><tr><td>JJ</td><td>MM</td><td>DD</td></tr><tr><td></td><td></td><td></td></tr></table>	JJ	MM	DD				at	<table border="1"><tr><td>HH</td><td>MM</td></tr><tr><td></td><td></td></tr></table>	HH	MM			UTC
JJ	MM	DD													
HH	MM														
Start of the event;	forecaster assessment	<table border="1"><tr><td></td><td></td><td></td></tr></table>				at	<table border="1"><tr><td></td><td></td></tr></table>			UTC					
End of the event;	forecaster assessment	<table border="1"><tr><td></td><td></td><td></td></tr></table>				at	<table border="1"><tr><td></td><td></td></tr></table>			UTC					

**Level of risk as appreciated by RSMC** (put 1 in the chosen cell)

		No	Low	Med.	High
Level of risk	1 day before:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Level of risk	2 days before:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Probabilities of medium range outlooks as appreciated by RSMC**

Probability	3 days before:	<input type="checkbox"/>	%
Probability	4 days before:	<input type="checkbox"/>	%
Probability	5 days before:	<input type="checkbox"/>	%

**Mark for usefulness of products** (put 1 in the chosen cell)

	Guidance
RSMC Pretoria	<input type="checkbox"/>

**KEY**

- A = Very useful (basis of the warning)
- B = Useful (aided warning confidence)
- C = Neutral (not useful)
- D = Negative (misleading)
- X = Not used

	ECMWF	NWP	EPS
	NCEP		
	Met Office		

**Comments including information on usefulness and applicability of used tools**

## ANNEX III: Template for the SWFDP Regional Subproject Quarterly Progress Report

### STATUS OF THE REGIONAL SUBPROJECT

**PERIOD:** 6 November 2006 – 28 February 2007  
**NMHS:**

1. **HIGHLIGHTS OVER THE PERIOD**
2. **OVERVIEW OF PRODUCTS**
  - a. Usefulness of RSMC-Pretoria guidance
  - b. Usefulness of SWFDP NWP/EPS Products received from each global Centre and RSMC UM-SA12
3. **PROJECT EVALUATION AGAINST SWFDP GOALS**

SWFDP GOAL	IMPACT
To improve the ability of NMCs to forecast severe weather events	
To improve the lead time of alerting these events	
To improve the interaction of NMCs with Disaster Management and Civil Protection Authorities before, during and after severe weather events	
To identify gaps and areas for improvements	
To improve the skill of products from Global Centres through feedback from NMCs	

4. **EVALUATION OF WEATHER WARNINGS** (feedback from customer?, standardized questions to disaster authorities?)
5. **SUMMARY** (general comments, challenges, etc, details in the Evaluation Table)
6. **CASE STUDY** (PowerPoint Presentation to include guidance products (RSMC and NWP), satellite imagery, warnings issued, impact evidence etc)

(Evaluation Table according to the annex to the Maputo's final report)

**Evaluation Table**

Date	SWFDP Evaluation Form event Nr (If applicable)	Weather type	Location	Observed amount (rainfall or wind speed)	RSMC Guidance		Which NWP/EPS forecast product(s) used by NMC	Local Warnings issued	Impact
dd/mm/yy		Mesoscale rainfall or synoptic scale rainfall or strong winds (convective or synoptic)		(mm/period or kts)	Amount predicted	Usefulness (1-4) 4 is best	List by centre		

(Evaluation Table after the modifications proposed by the Maputo's meeting  
and attached to the email I sent on the 06/03/07)

**Quarterly Evaluation Table (to be fulfilled according to the Severe Weather Evaluation Form)**

Starting date of the event	SWFDP Evaluation Form Event Number	Type of event Heavy Precipitation or Strong Wind	Region affected	Highest observed value	RSMC Guidance		Which NWP/EPS forecast product(s) used by NMC	Local warnings issued?	Impact of the event	Impact of the warning	
					Amount predicted (same unit as in the preceding column)	Usefulness from 1 to 4 1- Misleading 2 - Not useful 3 - Useful 4 - Very useful					
dd/mm/yy		Indicate if extreme phenomena are the consequence of severe convection		<b>(mm/period or kts, according to the phenomenon)</b>			(RSMC UM-SA12 ECMWF, Met-Office, NCEP)	Usefulness from 1 to 4 1- Misleading 2 - Not useful 3 - Useful 4 - Very useful			