

SERVICE DELIVERY CONCEPTS AND THE NAMIBIAN SITUATION

Workshop on Achieving Benefits of
Enhanced Service Delivery by National
Meteorological Services (NMSs) in
Eastern and Southern Africa

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Maury, Matthew Fontaine, 1853 -- Brussels – 1st International Maritime Conference -An Uniform

System of Meteorological Observations Sea●

- ...Allow me to add, that we are taking part in a proceeding to which we would vainly seek for a parallel in history. Heretofore, when naval officers of different nations met in such numbers, it was to deliberate at the cannons' mouths and the most efficacious means of destroying the human species. To-day, on the contrary, we see assembled the delegates of almost every maritime nation, **for the noble purpose of serving humanity** by seeking to render navigation more and more secure. I think, Gentlemen, we may congratulate ourselves with pride upon the opening of this new era.

Participants at the First Conference

International Meteorology, Brussels, 1853

- [Matthew Fontaine Maury](#), of the [US Navy](#), was instrumental in promoting the convening of the first true International Meteorological Conference from late August through early September of 1853. The Conference was attended by:
- [Adolphe Quetelet](#), director of the [Royal Observatory of Belgium](#) and general secretary of the *Academie royale des sciences, des lettres et des beaux-arts* with Victor Lahure, navy captain and general director of the Navy, represented [Belgium](#).

...Participants at the First Conference International Meteorology, Brussels, 1853

- P. Rothe, navy captain and director of the depot of marine charts represented [Denmark](#).
- A. De la Marche, hydrographic engineer for the imperial navy represented [France](#).
- [Frederick William Beechey](#), captain [Royal Navy](#) and member of the Naval Department or the Board of Trade with Henry James, captain royal engineers represented the [United Kingdom](#).
- [Marin H. Jansen](#), lieutenant of the Royal navy represented the [Netherlands](#).

...Participants at the First Conference International Meteorology, Brussels, 1853

- Nils Ihlen, lieutenant of the royal navy represented [Norway](#).
- J. De Mattos Corroêa, captain-lieutenant of the Royal navy represented [Portugal](#).
- Alexis Gorkovenko, captain-lieutenant the Imperial navy represented [Russia](#);
- Carl Anton Pettersson, first lieutenant royal navy represented [Sweden](#).
- Matthew Fontaine Maury, lieutenant of the [Navy](#) represented the [United States](#).

Paradigm Change

- Nonaka SECI MODEL
- A model of knowledge creation process to understand the dynamic nature of knowledge creation and to manage such processes effectively – Proposed by Ikujiro Nonaka and Hirotaka Takeuchi. It assumes that there is a spiral of knowledge involved in their model, where the **explicit** (open, clear, overt, plain, unambiguous, unequivocal) and **tacit** (unspoken, implicit, inferred, implied, unstated) knowledge **interact** with each other in a continuous process.

...Paradigm shift

- This spiralling process leads to creation of new knowledge. The central thought of the model is that knowledge held by individuals is shared with other individuals so it interconnects to a new knowledge. The spiral of knowledge or the amount of knowledge, grows all the time when more interaction (rounds) takes place.

Nanoka

- **Socialization**

Sharing tacit knowledge through face-to-face communication or shared experience.

- **Externalization**

Trying to convert tacit knowledge to explicit knowledge by developing concepts (ideas, notions, thoughts, perceptions, theories, hypothesis, views or beliefs) and models. In this phase tacit knowledge is converted to understandable and interpretable form, so it can be also used by others. Externalized and theoretical knowledge is a base for creating new knowledge.

Nanoka

- **Combination**

When knowledge is in explicit form it can be combined with the knowledge that has been accumulated earlier. In this phase knowledge is also analyzed and organized.

- **Internalization**

Internalization means understanding explicit (open, precise, specific, definite, frank, candid) knowledge. It happens when explicit knowledge transforms to tacit and becomes a part of individual's basic information.

Nanoka

- Cycle continues now in the spiral of knowledge back to socialization when individual shares his tacit knowledge silently. This is how amount of knowledge grows and the previous conceptions might change.
- The creation of knowledge is a continuous process of dynamic interactions between tacit and explicit knowledge. The four modes of knowledge conversion interact in the spiral of knowledge creation. The spiral becomes larger in scale as it moves up through organizational levels, and can trigger new spirals of knowledge creation.

Nanoka

- Benefits of the SECI model
 - Appreciates the dynamic nature of knowledge and knowledge creation.
 - Provides a framework for management of the relevant processes.

Service Delivery - Definition

- In economics and marketing - a service is the non-material equivalent of a good.
- Service provision/ delivery is an economic activity that does not result in ownership
- It is a process that generates benefits by facilitating a change in customers, a change in their physical possessions, or a change in their intangible assets.

Main Attributes of Services

- Intangibility - They cannot be seen, handled, smelled, etc. There is no need for storage. Because they are difficult to conceptualize, services /marketing requires creative visualizations to effectively make the intangible more concrete. From the customer's point of view, this makes it difficult to evaluate or compare services prior to experiencing the service.
- Perishability - Unsold service time is "lost", that is, it cannot be regained. It is a lost economic opportunity.
- Lack of transportability - Services must be consumed at the point of "production".
- Lack of homogeneity - Services are typically modified for each client or each new situation (customised).

...Main Attributes of Service

- Labour intensity - Services usually involve considerable human activity, hence human resource management is important. The human factor is often the key success factor in service industries. It is difficult to achieve economies of scale or gain dominant market share.
- Demand fluctuations - It is very difficult to estimate demand. Demand can vary by season, time of day, business cycle, etc.
- Buyer involvement - Service provision requires a high degree of interaction between user and service provider.

Principles of Service Delivery

- **Application of State and Federal Regulations:** Many state and federal statutes and regulations provide safeguards and supports consumers/ customers. Knowledge and application of the statutes and regulations are key elements of "best practices" service delivery.
- **Customer-Centered Services:** We recognize that customers have individual needs and preferences, determined or influenced by their diverse and different activities. The role of service providers is to provide customers with information, while respecting their choices and beliefs, building on strengths, and involving them in decision making and service delivery.

...Principles of SD

- **Functional Outcomes:** Services must lead to individually meaningful and functional differences in the livelihoods of people.
- **People-First Language:** When providing services to customers, the person comes first. Their needs, demands, feelings, opinions and wishes come first.
- **Self-Determination:** Freedom, authority, support, and responsibility are the four principles of self-determination. Users have a right to determine services they need and or are entitled to in times of extreme weather events (floods, cyclones, droughts, tsunamis etc).

...Principles of SD

- **Team-Oriented Service Delivery:** No one discipline has the expertise necessary to meet the needs of all customers, Partnerships, coordinated, team-oriented decision-making are essential.
- **Natural Environments:** Evaluation and intervention take place in the environments where customers live and participate. People in those environments are given information and supports appropriate to their practices, interactions and activities.

...Principles of SD

- **Cultural Sensitivity:** Service providers need to be aware of cultural factors that can influence their interactions customers, and must provide culturally appropriate services to maximize effectiveness.
- **Evidence-Based Practices:** Evaluations and interventions are based on the "the integration of best research evidence with experience and values. Evidence-based practice is a process of life-long and self-directed learning

Typical Factors Involved in Service Delivery

- Service Providers
- Clients/ Users
- Equipment Used in service provision (e.g. vehicles, cash registers)
- Physical Facilities(e.g. buildings, car ports and waiting rooms)
- Other people at the service delivery location

Push And Pull Models of Service Delivery

- A push-pull-system describes the movement of a product or information between supplier/service provider and the user/customer. On markets the consumers "*pulls*" the goods or information they demand for their needs, while the service providers or suppliers "*pushes*" them toward the consumers.

Pull strategy

- In a "pull" system the consumer requests the product and "pulls" it through the delivery channel. Companies that only manufacture or produce goods on order by customers are examples of this strategy.
- Applied to that portion of the supply chain where demand uncertainty is high
- Production and distribution are demand driven
- No inventory, response to specific orders
- Difficult to implement

Push Strategy

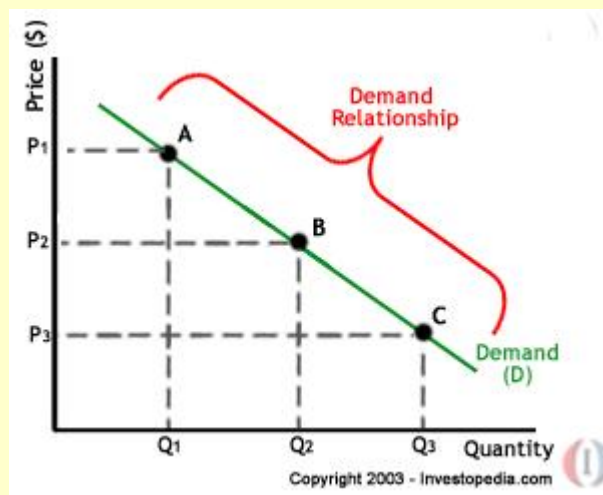
- Applied to that portion of the supply chain where demand uncertainty is relatively small
- Production & distribution decisions are based on long term forecasts
- Based on past orders received from retailer's warehouse
- Inability to meet changing demand patterns
- Large and variable production batches
- Unacceptable service levels
- Excessive inventories due to the need for large safety stocks
- less expenditure on advertising than pull strategy

Supply Chain

- With a push-based supply chain, products are pushed through the channel, from the production side up to the user. The manufacturer sets production at a level in accord with historical ordering patterns from users. It takes longer for a push-based supply chain to respond to changes in demand, which can result in overstocking or bottlenecks and delays and unacceptable service levels and product obsolescence.
- In a pull-based supply chain, procurement, production and distribution are demand-driven so that they are coordinated with actual customer orders, rather than forecast demand.
- A supply chain is almost always a combination of both push and pull.

Supply and Demand

In the Supply and Demand concept, Demand refers to the amount or quantity of a product or service desired by users or buyers which they are willing to buy at a certain price. Supply refers the amount of products or services the market can offer. The quantity supplied refers to the amount of a certain good producers are willing to supply when receiving a certain price. Price, therefore, is a reflection of supply and demand



Cost Benefit Analysis

- A cost benefit analysis finds, quantifies, and adds all the positive factors. These are the benefits. Then it identifies, quantifies, and subtracts all the negatives, the costs. The difference between the two indicates whether the planned action is advisable. The challenge in doing a cost benefit analysis well is making sure that all the costs and all the benefits are properly quantified.
- Cost benefit analysis is a term that refers both to:
 - ✓ helping to appraise, or assess, the case for a [project](#), programme or policy proposal;
 - ✓ an approach to making economic decisions of any kind.

...Cost Benefit Analysis

- Cost–benefit analysis is often used by governments to evaluate the desirability of a given intervention. It is an analysis of the cost effectiveness of different alternatives aimed at determining whether the benefits outweigh the costs. The aim is to gauge the efficiency of the intervention relative to the status quo. The costs and benefits of the impacts of an intervention are evaluated in terms of the public's willingness to pay for them (benefits) or willingness to pay to avoid them (costs).

Problems Associated with CBA

- The accuracy of the outcome of a cost–benefit analysis depends on how accurately costs and benefits have been quantified.
- Heavy reliance on past like projects (often differing markedly in function or size and certainly in the skill levels of the team members)
- Heavy reliance on the project's members to identify (from their collective past experiences) the significant cost drivers
- Reliance on very crude heuristics to estimate the money cost of the intangible elements
- Inability to completely dispel the usually unconscious biases of the team members (who often have a vested interest in a decision to go ahead)

... Problems with CBA

- Determining which costs should be included in an analysis (the significant cost drivers), pose another great challenge. This is often controversial because organizations or interest groups may think that some costs should be included or excluded from a study.

Economies of Scale

- **Economies of scale**, in [microeconomics](#), refers to the cost advantages that a business obtains due to expansion. There are factors that cause a producer's average cost per unit to fall as the scale of output is increased. "Economies of scale" is a long run concept and refers to reductions in unit cost as the size of a facility and the usage levels of other inputs increase.
- Economies of scale is a concept explaining patterns of international trade leading to the the growth of some smart companies. Some economies of scale may require a larger market than is possible within a particular country - a condusive environment for free trading.

...Economies of Scale

When do companies attain Economies of Scale?

- Purchasing-bulk buying of materials through long-term contracts
- Managerial - increasing the specialization of managers)
- Financial - obtaining lower-interest charges from banks when borrowing and access to a greater range of financial instruments,
- Marketing - spreading the cost of advertising over a greater range of output in media markets,
- Technological - taking advantage of returns to scale in the production function.
- Learning by Doing – Practise is perfect

Total Government Support

- Country size about 825,000 sq km
- Population about two million people
- Namibia is divided in 13 political regions
- Entangled between 2 deserts(Namib and the Kalahari) and 3 perennial rivers (Kavango and Kunene in the North and Orange in the South)
- Attained Independence in 1990
 - Executive, Legislature and independent Judiciary
 - Free and fair elections every four years

Total Government Support

- Joined WMO in 1991
- Ratified SADC Protocol on Transport, Communication and Meteorology (Current Chair of SADC)
- Other environmental Conventions such as UNFCCC, CBD
- Cabinet Decisions
 - Regional Inclusiveness
 - Decentralization
 - Recruitment of Experts
 - CBS Endorsement

...Total Government Support

- Hosting of CBS
 - Deputy Prime Minister on behalf of His Excellency The President of Namibia.
 - Minister of ICT on behalf of the Minister of Works and Transport
 - Deputy Minister of Works and Transport
 - PS, DPS and Under Secretary
 - Provided Sufficient Resources or should one say Excellent Environment?
- Training of Meteorological Personnel
- Financial Contribution to the WCC-3

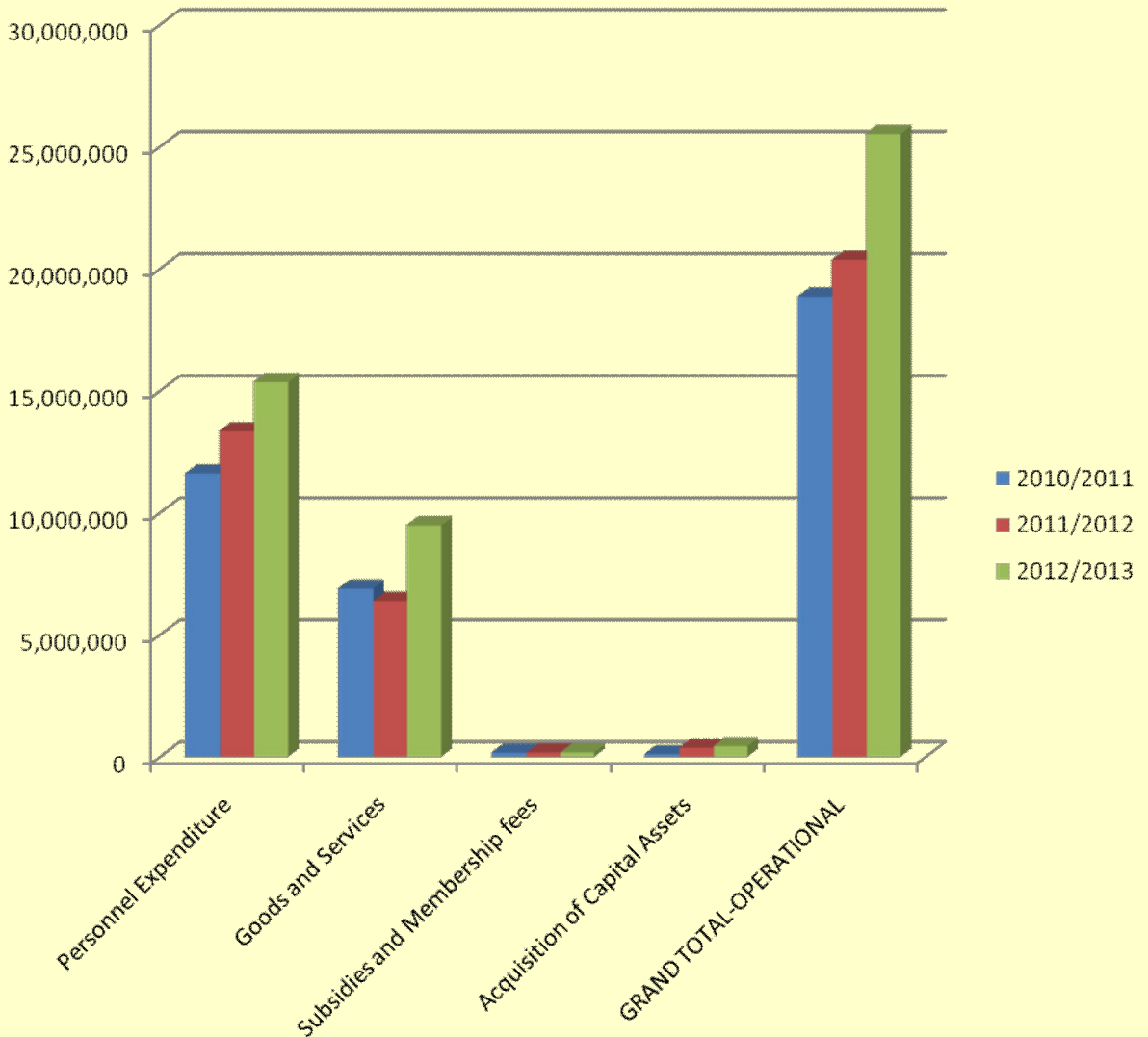
...Total Government Support

- Ministry's Commitment to train meteorological personnel
 - Six students send to IMTR – Nairobi, Kenya (for Diploma course)
 - Three staff members to be send for B. Sc in Meteorology in October 2011
 - Restructuring of the Service into a fully fledged [Directorate of Meteorological Service](#)

VISION 2030 and NDPIII

- Development plans of the National Meteorological Service are included in overall Government development plans such as Namibia's Vision 2030, National Development Plan III (NMS is a sector on its own with specific developmental goals).
- Strategic Plan of the MWT.

Operational Budget



Development Budget

- Project Name

To Extend and Upgrade the Facilities of the Meteorological Service

- Project Goal

To improve the grossly under developed meteorological services infrastructure in Namibia and expand the geographic coverage of data and services in order to contribute effectively to national socio-economic development by meeting the **needs of users** and complying with international standards, regulations and requirements, inter alia, those of World Meteorological Organization, International Civil Aviation Organization (ICAO) and Southern African Development Community (SADC)

Project Components

- **Calibration equipment**
- **Manned Meteorological Stations**
- **Automatic Weather Stations**
- **Procurement of upper air weather systems**
- **Human Resources Development**
- **Institutional Reform**
- **Climate Service Decentralization**
- **Hazardous Weather Detection**
- **Procurement and Installation of a Weather Radar**
- **Improvement of meteorological facilities**

Cost Recovery

- Policy Decisions
 - Ministers' of SADC endorsed recovery of costs for aeronautical meteorological services at their meeting held in Swakopmund
 - ICAO in their audit report recommended that cost recovery for delivering aeronautical meteorological services should be started
 - Treasury instructions
- Opportunities
 - Aeronautical Meteorological Services
 - Marine Meteorological Services
 - Specialized User Tailored Services and Data
 - Weather Forecasts and Warnings on Mobile Phones
 - Sustenance of quality, timely and accurate and quality services

Cost Recovery

- Constraints in Implementation
 - [Structure](#) very limiting and outdated
 - Limited human resources
 - Lack of Legal Framework, regulations and policies
- Basic Services/ Public Goods
 - Primary responsibility of all Governments are the protection of lives and property of their citizens
 - NMSs plays a critical in this role through the regular provision of weather and climate advisories, warnings and advisories, particular on severe weather phenomena such as floods, tropical cyclones, tsunamis, droughts etc. Citizens of all countries have the **right** to these services which are in any case paid for by their government.

Meteorological Forecasts

... To be fore-warned is to be fore-armed ...

Weather Forecasts

Most visible information product of
Meteorological Services, the world over
including Namibia

Several categories of forecasts

Categorized by “lead time”

short range - following day and up to a
few days ahead;
typically 3 days.

medium range - up to a week or so
- prepared largely from
model outputs obtained
from co-operating
international weather
centres

Meteorological Forecasts - cont'd

On very small lead time frame

Nowcasting: essentially concerned with what is happening now and what is likely to happen in a few minutes time to an hour or at the most!

Made possible by real-time radar and satellite imagery

Particularly useful in tracking hazardous weather conditions such as rainy storms, dust storms; and their trajectories (paths)



A flooded Maize field



A flooded Home



A flooded Filling Station



Where to??

Meteorological Forecasts - cont'd

Seasonal Forecasts

Currently issued only for the rainy season,
broken into 2 parts:

- ✓ October to December
- ✓ January to March

Both disseminated to users in
September, with intra-season
monthly updates

Done under the auspices of SADC
CSC

Meteorological Forecasts - cont'd

About Seasonal Forecasts

Based on:

Statistical correlation methods, mainly

Ocean-atmosphere teleconnections

e.g. El Nino/Southern Oscillation in equatorial pacific found to correlate reasonably with seasonal rainfall in southern Africa and elsewhere; accounting for a substantial amount of the variance.

Strong El Nino conditions are often associated with below normal rainfall performance (drought) in Namibia; e.g. 1997/98

La Nina conditions (opposite of El Nino) are often associated with above normal rainfall performance in Namibia!

Meteorological Forecasts - cont'd

Namibia Meteorological Service:

- produces the short-range, medium-range, and seasonal forecasts, in addition to the frequently produced aeronautical forecasts for aviation operations
- is positioning itself to implement nowcasting

ALL forecasts are provided freely through:

- television broadcasts
- radio broadcasts
- print media, and
- feedbacks to specific inquiries

Meteorological Forecasts - cont'd

Issues of Concern:

- Timeliness in delivery of seasonal outlooks: desirable vs feasible. Methodology used in the SARCOF outlooks uses SST data for the months of Jun-Sep mainly, thus limiting the lead-time
- Scientific limitations in long-range forecasts: Skill in f/cs beyond medium range (i.e. a week or so) is very low .. in Namibia and the world over

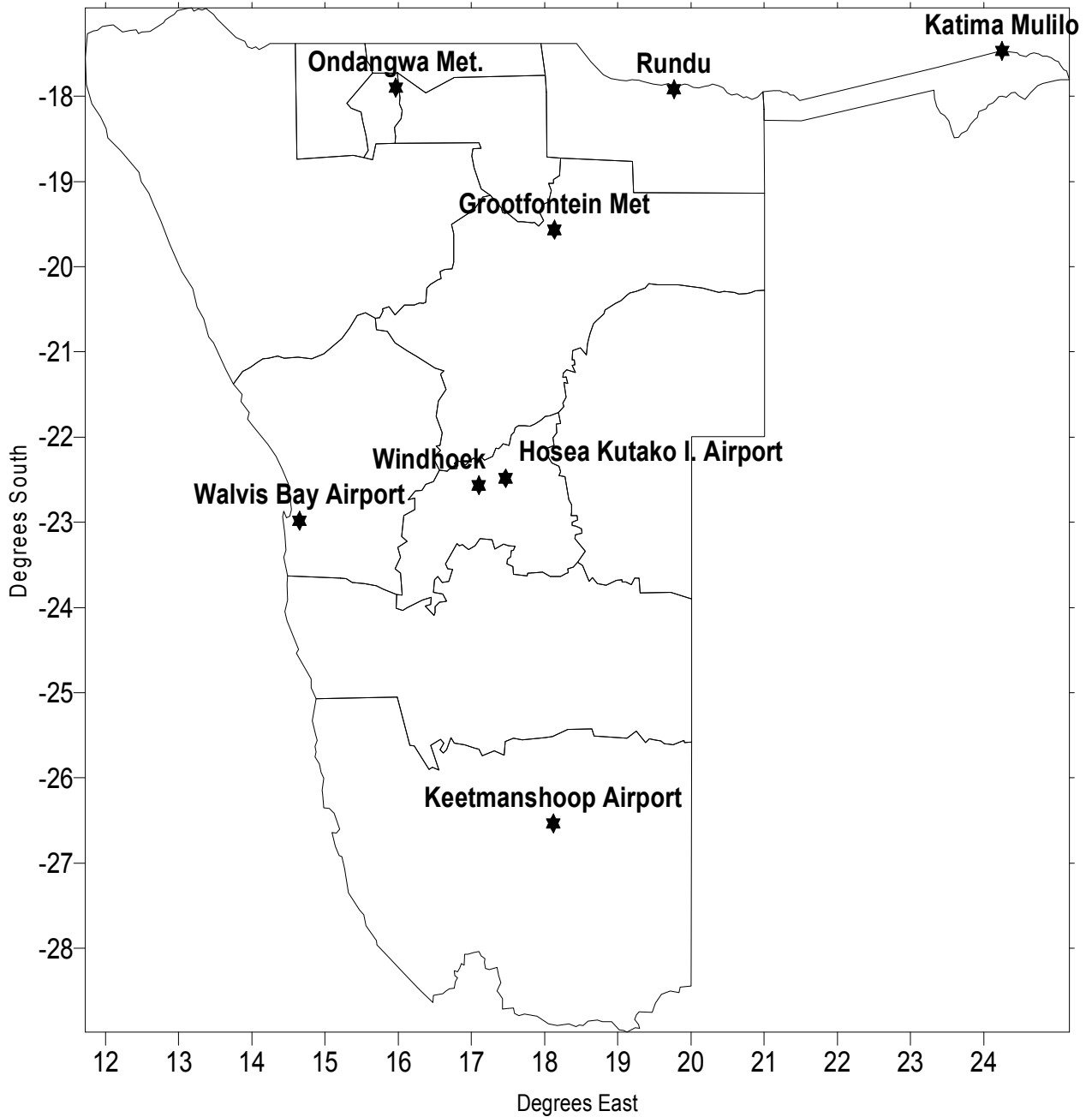
Meteorological Forecasts - cont'd

Issues of Concern – cont'd:

- Clarity of the forecasts: F/cs are not explicitly clear – largely ‘cos of their probability nature
- Inadequate forecast interpretation skills by field staff (Extn officers) who are the actual interfaces with the farmers
- Language: The F/cs are derived and produced in English!

Data Availability: Station Networks **cont'd**

(Manned synoptic/climate stations)



Climate Data Availability ... cont'd

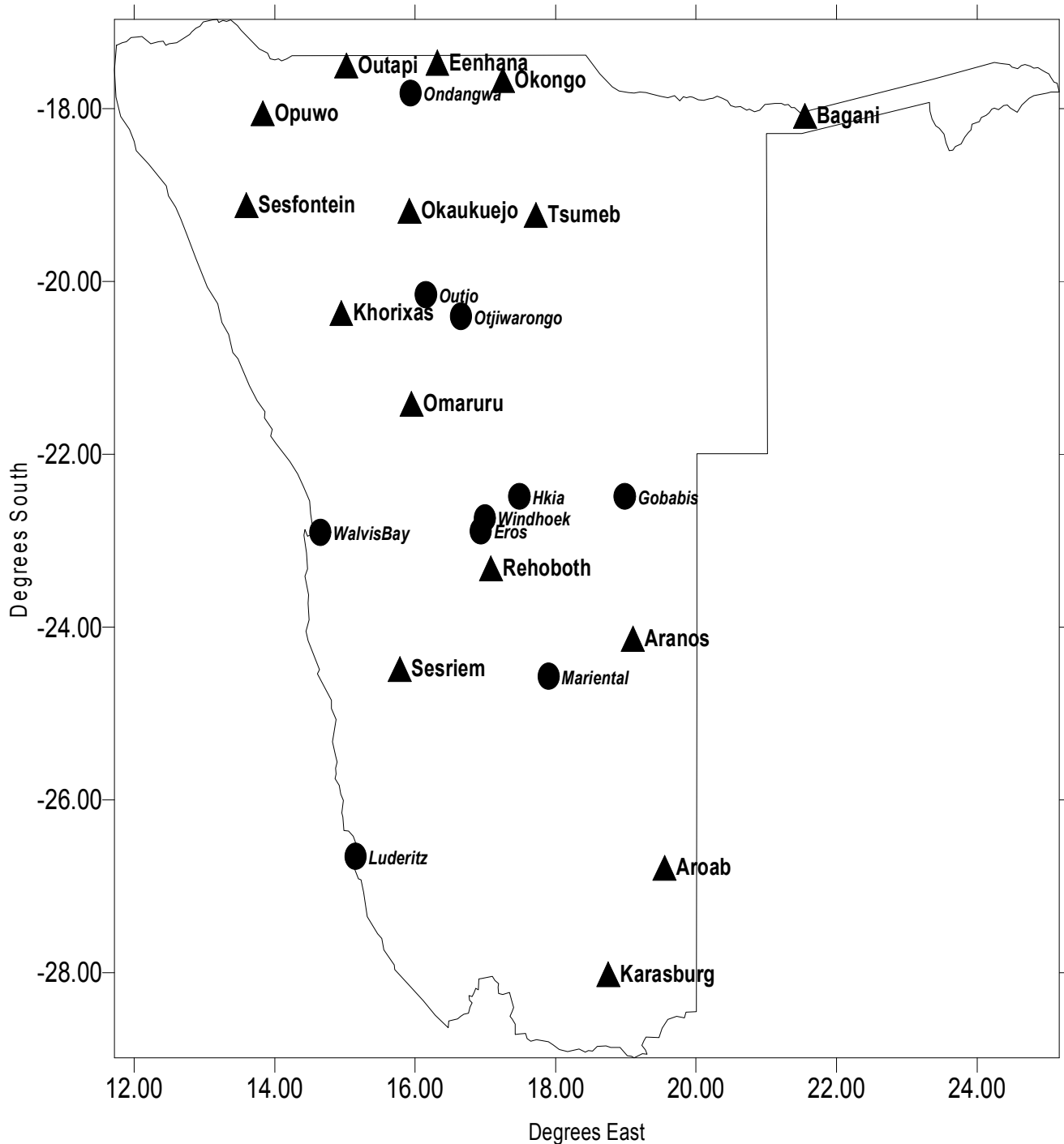
Automatic Weather Stations (AWSs)

- 48 AWSs
- Complement the 8 manned stations Generate a lot of data
- Particularly useful in places without human settlements
- But rather hi-tech and require good maintenance capacity

Climate Data Availability ... cont'd

Distribution of the 25 AWSs

(All commissioned between 2003 to 2005)



Data Availability:

- Parameters measured

Temperature

daily max & min

dry- & wet-bulb

dew-point

Rainfall

Humidity

Wind

Atmospheric Pressure

.....

Rainfall stations measure only rainfall;
as daily cumulatives (08h00 to
08h00)

Data Availability: Climate Data Bank

Holds digital records for a number of climate parameters, which include Temperature (daily max & min), dry- & wet-bulb, dew-point, rainfall, humidity, wind, atmospheric Pressure ...

- Over 200 000 monthly records of daily data
- Over 400 000 daily records of hourly data
- Monthly and 10-daily derivatives and extreme values easily generated as needed
- Many records on manuscripts; digitization incomplete and on-going

Climate Data Availability ... cont'd

Obtaining Climate Data from the Meteorological Service

Can phone, fax, or e-mail

Simple clear request, stating:

- ✓ What you need, and
- ✓ Purpose for which the data or information will be used
- These request attributes are reflected on user request form and are intended to capture user profiles and trends. Necessary for proactive service planning & delivery



REPUBLIC OF NAMIBIA

**MINISTRY OF WORKS, TRANSPORT AND COMMUNICATION
Department of Transport - Meteorological Services Division**

REQUEST FORM FOR CLIMATE INFORMATION

Date of Request: _____ 2. Date of Info Supply: _____

Serving Officer: _____ / _____
(Name & Signature)

Name & Address of Client: _____

Phone: _____ Fax: _____ E-mail: _____

Description of Requirements: _____

User Sector/Purpose: _____

Action Taken & General Remarks, if any: _____

Information Collected by

Name/Signature: _____

Date: _____

USER SERVICES

3 broad channels of service delivery:

- Regular or Routine Climate Bulletins
 - △ 10-daily rainfall bulletins
 - △ monthly rainfall & temperature bulletins
 - △ quarterly rainfall bulletins
 - △ climatological year books

- Occasional Climate Publications
 - mainly research type publications

- Responding to User-specific Requests
 - △ for data
 - △ for analytical climate information
often necessitating some research or investigation

USER SERVICES ... cont'd

USER SECTORS & THEIR TYPICAL NEEDS

Beneficiary	Typical Needs
1. Air Transport	<p>Weather conditions at take off time, at cruising level, and at terminal aerodrome</p> <ul style="list-style-type: none">- Pressure, Temperature, Visibility, Cloud- Jetstreams likely impact flight economics <p>Planning data for design & programming</p> <ul style="list-style-type: none">- Wind direction/speed- Average and extreme temperatures- Wind-gusts- Return period analyses of extreme values and peaks over threshold values

USER SERVICES ... cont'd

USER SECTORS & THEIR TYPICAL NEEDS

Beneficiary	Typical Needs
2. Maritime Transport	<p>Weather conditions at sea and coastal areas</p> <ul style="list-style-type: none"> - Storms - Winds and Ocean currents
3. Road Transport	<p>Meteorological planning data for road construction</p> <ul style="list-style-type: none"> - Typical climatic conditions (rainfall & temperature) - Extreme conditions (high intensity rainfall & temperature statistics)

USER SERVICES ... cont'd

USER SECTORS & THEIR TYPICAL NEEDS

Beneficiary	Typical Needs
4. Agriculture & Veterinary	<ul style="list-style-type: none">• Climatic trends and variations in time and space• All ranges of weather forecasts (short, medium and long range)• Indices on climate variability and change• Onset and Cessation of rainy seasons• Locality specific climate data• Seasonal Climate Predictions• Return period analyses of extreme values and peaks over thresholds
5. Tourism	Locality specific typical climatic conditions <ul style="list-style-type: none">- rainfall, temperature, humidity, etc.- climatic comfort indices

USER SERVICES ... cont'd

USER SECTORS & THEIR TYPICAL NEEDS

Beneficiary	Typical Needs
6. Water Resources	<ul style="list-style-type: none">•All ranges of weather forecasts (short, medium, long range)•Locality specific rainfall intensities•Seasonal Climate Predictions•Return period analyses of extreme values and peaks over user specified threshold values•Evaporation and evapotranspiration•Indices on climate variability and Change

USER SERVICES ... cont'd

USER SECTORS & THEIR TYPICAL NEEDS

Beneficiary	Typical Needs
7. Energy	<p>Climate data for renewable energy applications</p> <ul style="list-style-type: none"> – solar radiation, sunshine duration, & wind <p>Return period analyses of extreme values and</p> <ul style="list-style-type: none"> - wind, rainfall, temperature
8. Health	<p>Rainfall and temperature in relation to disease outbreaks – e.g. malaria</p> <p>Air Pollution potential</p>
9. Education	All climatic parameters and derivatives
10. Off-shore mining	Weather conditions at sea – wind, storms, ocean tides and currents

USER SERVICES ... cont'd

USER SECTORS & THEIR TYPICAL NEEDS

Beneficiary	Typical Needs
11. Fisheries and Marine Resources	<ul style="list-style-type: none">• Sea-surface temperature• Weather conditions at sea
12. Sports, Recreation and Filming industry	Locality specific climatic conditions All ranges of weather forecasts (short, medium and long range)
13. Emergency Management	All ranges of weather forecasts (short, medium and long range)
14. Environment	Rainfall intensities (contributing to land degradation) Extreme temperatures Indices on climate change and variability

USER SERVICES ... cont'd

USER SECTORS & THEIR TYPICAL NEEDS

Beneficiary	Typical Needs
Environment (Continued)	Rainfall performance indices Drought occurrences & associated severity levels All types of severe weather conditions
15. Building & Construction	Air-conditioning design data Rainfall intensities Typical temperature and rainfall of specific places Statistics on extreme winds (gusts) for wind-load design of multi-storey buildings Return period analyses of extreme values and peaks over user specified threshold values

USER SERVICES

% of Sectoral Requests

User Sector	% of Total Requests
Agric & Water Resources	31.3
Education & Research	25.4
Tourism	9.9
Energy	7.9
Environm & Nat Resources	7.6
Transport (excl aviation)	5.3
Building & Construction	5.0
Other	7.6

USER SERVICES ... cont'd

Drought Monitoring

Definitions of Drought

The term drought has many definitions:

- A sustained deficiency in rainfall to levels very much below normal (*meteorological drought*)
- A prolonged shortage of soil moisture to an extent that plant growth gets adversely affected. (*Agricultural definition*)
- An adverse factor in established human activities due to lack of or inadequate rainfall.
- A depletion of water reservoirs, low stream flows or total drying up of rivers and streams due to lack of rain. (*Hydrological definition*)
- An Effect of the shortage of water or moisture where and when it is needed. (*Economic definition*)

USER SERVICES ... cont'd

Drought Monitoring

Namibia Rainfall Performance Statistics - October-April Seasonal Rainfall Deciles

Station-ID	Station-Name	1989/1990	1990/1991	1991/1992	1992/1993	1993/1994	1994/1995	1995/1996	1996/1997	1997/1998	1998/1999	1999/2000	2000/2001	2001/2002	2002/2003	2003/2004	2004/2005	2005/2006
0312422X	Karasburg	6	2	2	6	7	2	3		1	9	10				6	8	9
03145776	Ariamsvlei	6	7	1	1	7		3	8	3	6	10			1			7
04191829	Keetmanshoop	2	2	5	8	9	2	5	7	2	5	8	5	6	1	8	9	10
05688179	Mariental	1	9	2	5	3	1	1		1	1	10	7		1			
06490648	Gobabeb	7	6	5	3	8	7	2	10	1	1	10	6	10	1			10
07347735	Walvis Bay	1	2	2	5	2	2	2	3	4	3	10	9	4	4	3	1	10
0740154X	Windhoek	5	1	8	2	3	1	1	7	1	2	10	9	7	3	10	9	10
07444197	Rosendal	1	8	3	5	8	1	1	10	3	5	10	10	9	5	4	7	
07827049	Westfallenhof	10	2	7	8	8	4	2	8	1	2	10	-		2	8	7	10
0784839B	Hosea Kutako Int. Airport	3	5	3	6	7	1	1	9	2	4	10	5	4	1	5	4	10
07878388	Gobabis	4	9	5	5	9	1	4	10	2	5	9	5	5	1	1		
0826595A	Karibib	10	8	1	7	9	4	2	8	6	3	9	10	6				
0828748A	Okahandja	4	3	6	3	7	1	1	6	2	8	10	10	3	5	6	7	10
08707755	Omaruru	5	6	4	2	8	2	1	3	1	2	10	6	3	4			
09163231	Kalkfeld	3	4	4	7	6	1	3	6	4	6	9	7	6	5			
09588339	Khorixas	8	4	2	1	2	10	2	8	1	1				5	8	10	10
10036086	Kamanjab	6	9	1	6	1	10	1	6	1	1	1						10
1006686X	Sitrusdal	3	10	3	3	4	2	1	9	2	1	6	8	5	4	9		
10085780	Otavi	4	5	2	1	7	1	1	8	3	2	10	-		3	9	1	
10102167	Grootfontein	4	6	3	7	10	1	2	8	1	4	9	8	3	1	8	4	10
10150355	Tsumkwe	1	6	1	6	8	1	1	6	1	1	10	-				2	
10517316	Okaukuejo	7	4	1	4	4	5	2	5	1	3	10	3	4	4		7	10
10553743	Tsumeb	8	4	1	1	5	3	4	7	1	4	8	5		1	6		
11022740	Oshivelo	2	3	3	3	4	1	1	10	2								
11057372	Mururani	4	8	2	3	9	1	4	5					7				
11995203	Ogongo	7	10	2	6	9	9	1								7		
11998208	Oshikuku	4	7	1	1	2	4	2	3									
1199872X	Ombalantu	2	2	2	2	1	1	4				-	8					
12084758	Rundu	3	4	1	5	8	1	1	9	1	4	8	6	5	4	9	2	9
12694482	Katima Mulilo	3	2	3	6	2	5	4	6	3	6	6	2	3	1	5	1	9

Notes:

(i) The statistical decile methodology for ranking rainfall performance is based on the available long historical rainfall records for each station. It essentially ranks rainfall performance on a scale of 1 to 10, with the lower end of the scale representing low rainfall and the higher end representing high rainfall. Typically, deciles 1 and 2 reflect drought conditions.

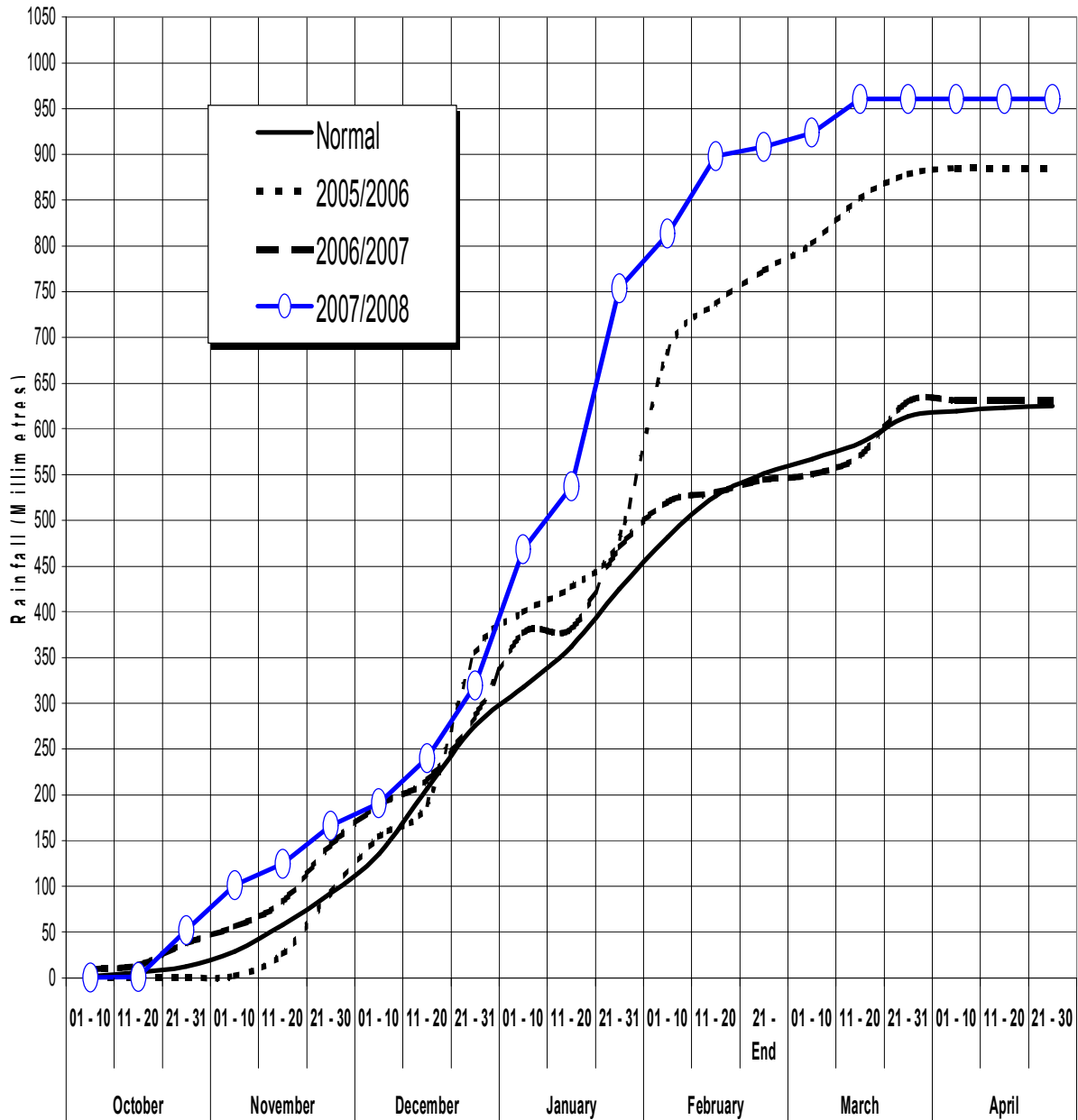
(ii) In general, deciles 1 and 2 reflect drought conditions.

Example of 10-daily Rainfall Monitoring Bulletin



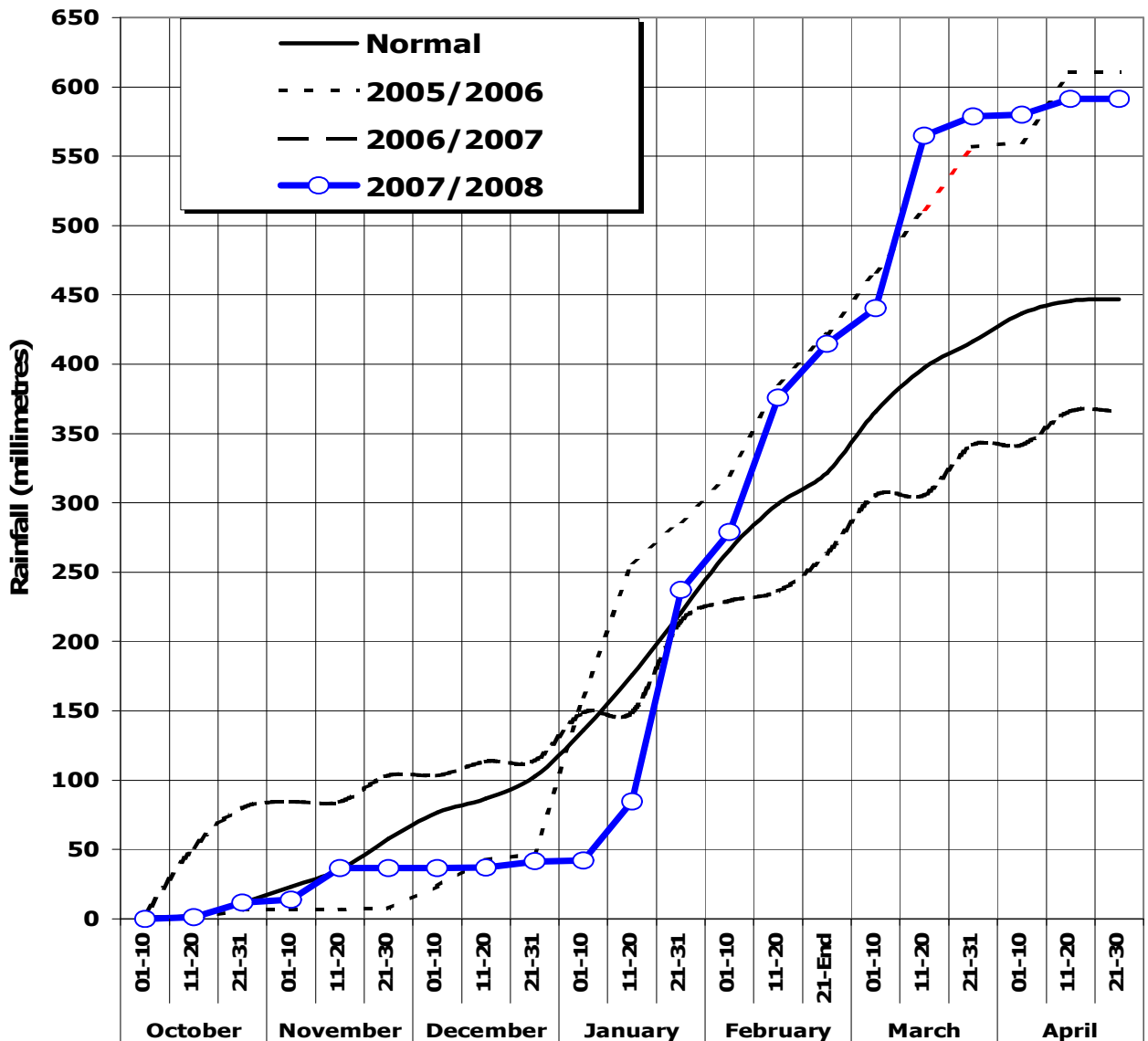
Example 10-daily Rainfall Monitoring Chart

Katima Mulilo 2007/2008 Seasonal Rainfall Progression Relative to Normal and to the Previous Seasons



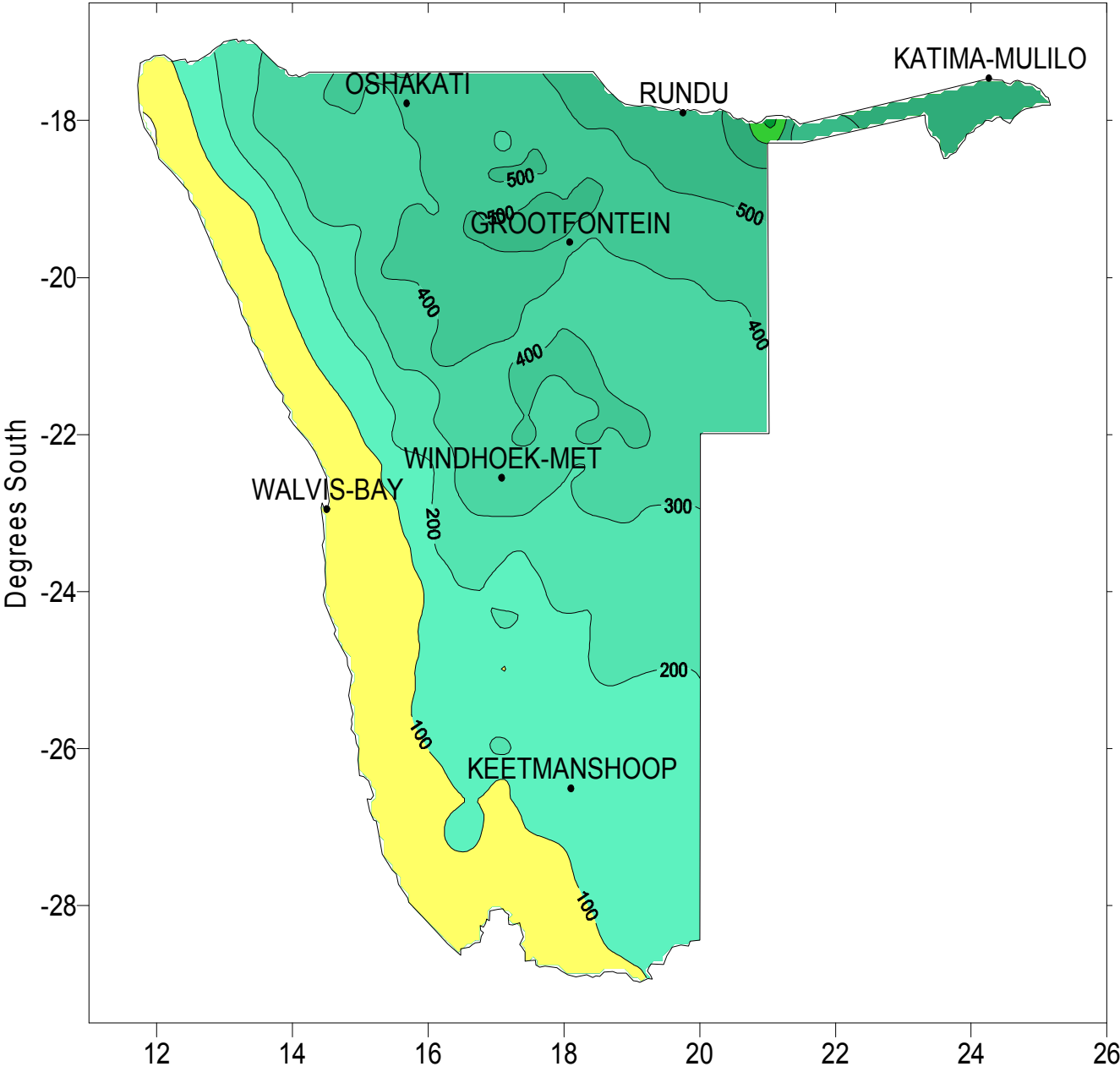
Example 10-daily Rainfall Monitoring Chart

Ondangwa 2007/2008 Seasonal Rainfall Progression Relative to Normal and previous seasons

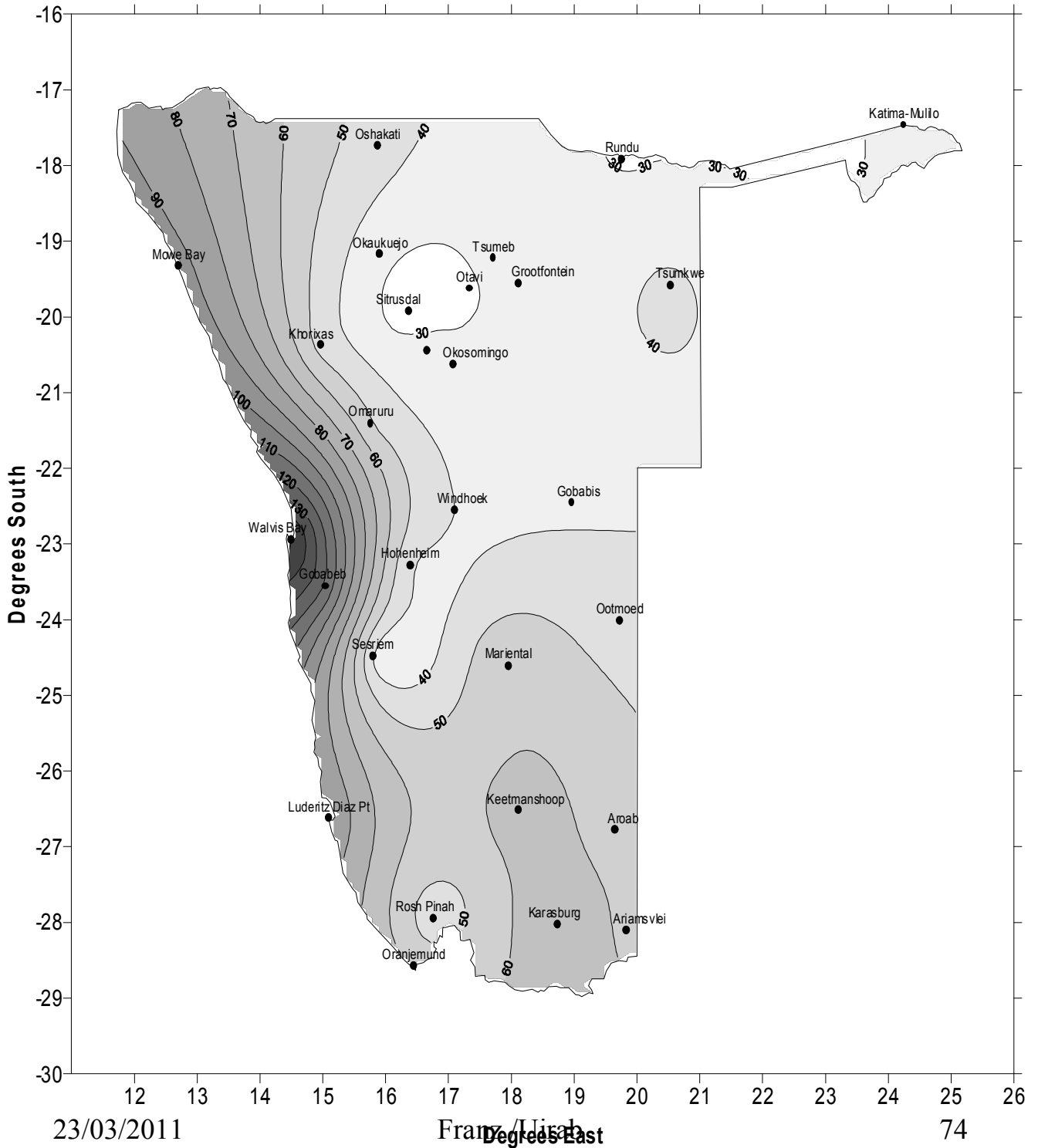


Spatial Distribution of Mean Annual Rainfall

Spatial Distribution of Mean Annual Rainfall (mm) in Namibia

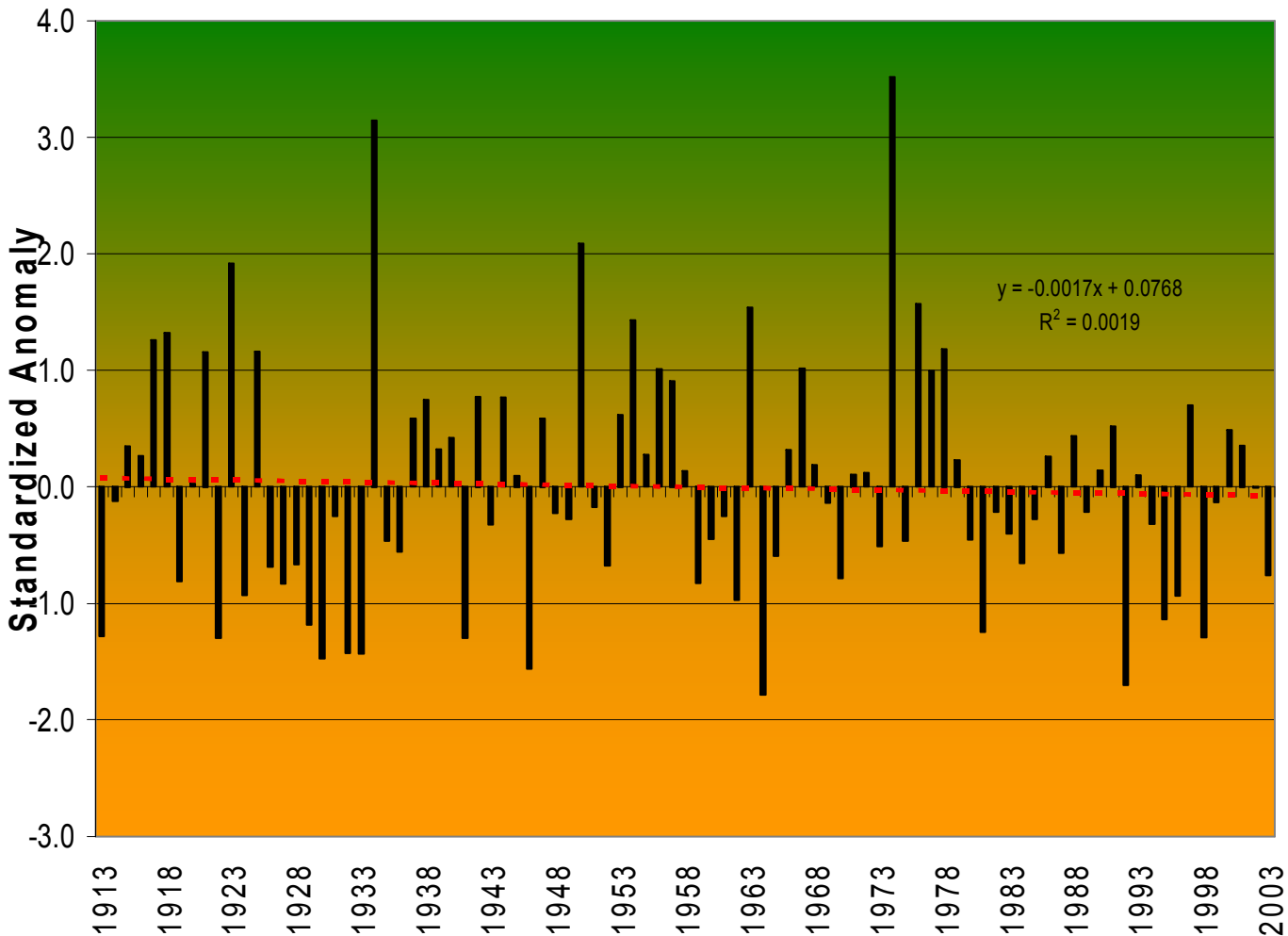


Namibia Annual Rainfall Temporal Variability (%)



An Example Temporal Variability

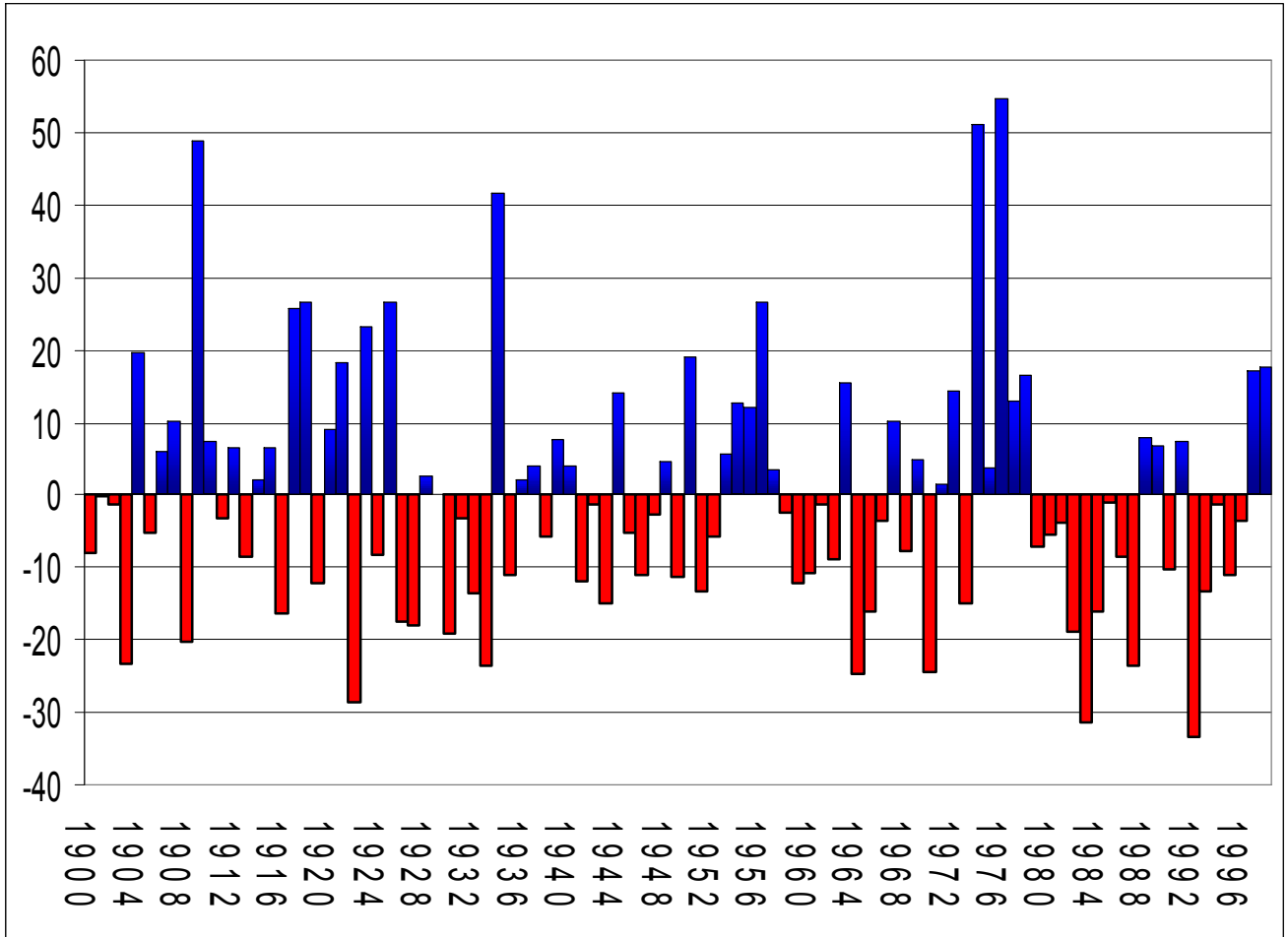
All-Namibia Annual Rainfall Standardized Anomalies Time Series



- High inter-annual variability, consistent with regional pattern
- Trend towards desiccation, but weak significance

JFM southern African Rainfall Anomalies

(after Washington, R; 2006 – Distinguishing between internal variability and forced variability)



- Large component of year to year variability
- Large component of multidecadal variability
- Not many years with ‘climatology’

Part III: Summary & Suggestions for Plenary Reflection ... cont'd

- Active Partnerships are required in Service Delivery
- Bringing Services to the People in the format they demand
- Periodic User interaction and awareness raising (meetings, seminars and workshops)
- Quality Products conforming to user requirements
- Joint ventures in applied research

How can we make ourselves relevant

- The laws of God, the laws of man,
He may keep that will and can
And how am I to face the odds
Of man's bedevilment and God's?
I, a stranger and afraid
In a world I never made. A poem
(1922) by A. E. Housman (1859-
1936)
- Individuals are solely responsible for giving their own life meaning and living that life passionately, sincerely and to the fullest, in spite of many existential challenges, obstacles and distractions including despair, angst, absurdity, alienation and boredom - Existentiality

THE END

- That all things that come to be have an end.
- That nothing which comes to be is ultimately satisfying. (Substitute, Combine, Adopt, Modify, Put to Other purposes, Eliminate, Reduce)
- That nothing in the realm of experience can really be said to be "I" or "mine",
- right understanding, right thought, right speech, right action, right livelihood, right effort, right mindfulness, and right concentration. **Gautama Buddha**

• THANK YOU