

DEPARTEMENT VAN WATERWESE / DEPT. OF WATER AFFAIRS
20 OKT. 1972

20 OCT. 1972



HIDROLOGIESE NAVORSINGSINSTITUUT
HYDROLOGICAL RESEARCH INSTITUTE

GEDENKPROGRAM

**By geleentheid van die
amptelike opening van die
Hidrologiese
Navorsingsinstituut te
Roodeplaat deur
Sy Edele S. P. Botha om 16h00,
Vrydag, 20 Oktober 1972**

Aankoms van Sy Edele S. P. Botha
Skriflesing en Gebed deur
ds. W. B. Jansen
16h00
Verwelkoming deur mej. J. Whitmore,
Djrekteur van die Instituut
Voorstelling van Sy Edele S. P. Botha
deur mnr. J. P. Kriel.
Sekretaris van Waterwese
Openingstoespraak en onthulling van
gedenkplaat deur
Sy Edele S. P. Botha
Bedankings deur
dr. P. W. de Lange
Besigtigingstoer vir eregaste

SOUVENIR PROGRAMME

**On the occasion of the official
opening of the Hydrological
Research Institute at
Roodeplaat by
the Hon. S. P. Botha
on Friday, 20 October 1972, at
16h00**

Arrival of the Hon. S. P. Botha
Scripture reading and Prayer:
The Rev. W. B. Jansen
Welcoming by Miss J. Whitmore,
Director of the Institute
Introduction of the Hon. S. P. Botha
by Mr J. P. Kriel.
Secretary for Water Affairs
Opening address and unveiling of
plaque by
the Hon. S. P. Botha
Acknowledgements by
Dr P. W. de Lange
Inspection tour for guests of honour



Meetdam in die Vaalrivier by De Hoop. Oor die 700 meetstasies in die vernaamste riviere in Suid-Afrika word deur die Afdeling Hidrologie beheer.
Gauging weir in the Vaal River at De Hoop. More than 700 gauging stations in the most important rivers in South Africa are operated by the Division of Hydrology.

THE HYDROLOGICAL RESEARCH INSTITUTE

The Hydrological Research Institute is one of the few organisations of its kind in the world.

Lack of abundant water being the basic hydrological problem in South Africa, it is fitting that the Institute should be set in a rather dry environment of bush and grass, typical of much of southern Africa. This ensures that the results of research carried out at the Institute will be widely applicable.

Situation

Located less than 30 km from the centre of Pretoria, the Institute overlooks Rooideplaas Dam on the Pienaars River, a headwater tributary of the northward flowing Crocodile River. The dam has a net capacity of 41,9 million m³ and is fed by three streams which drain a diversified catchment some 668 km² in extent from which the annual run-off averages about 20 million m³.

Design

The architects are to be complimented on having designed a building which not only blends well with its attractive natural setting but is functionally well planned: Hydrology being such a diversified and rapidly developing field of science, one of the main requirements was that the building should be adaptable to changing needs and not become obsolete. This flexibility has been achieved by the use of demountable partitioning for most of the interior walls which can thus be relocated at will.

Offices occupy the lower part of the front block, above them being the general facilities such as a small lecture theatre, conference room, library, drawing office and assembly room. The rear block comprises the laboratories; here the spacing of service outlets at intervals of 3m, coupled with the use of demountable partitions, enables the number and size of the laboratories and the positioning

of the laboratory benches to be easily altered. Also included in the laboratory block is a small insulated room in which the temperature and humidity can be controlled, as well as a large room for model studies. There is access to two sections of the roof, on which instruments can be mounted.

Linking the office and laboratory blocks are four service corridors. Functionally, therefore, the design of the building is modular, each research group having its own offices, laboratories and interlinking service corridor. The floor space of the building totals about 2200 m².

The rough stone used for the foundations and end walls harmonises with the surroundings, as does the columnar brickwork used on the facade and to screen the west-facing windows. Maintenance costs have been reduced to a minimum by selecting materials with a durable finish and by incorporating broad expanses of glass in the building.

In addition to the impressive view over the dam, another striking feature of the Institute is the large rock outcrop in the inner courtyard. In keeping with the natural surroundings only indigenous trees, aloes, succulents and flowering plants are being planted around the building.

Other facilities

The research is by no means confined to the laboratory. To the rear of the building is an outdoor experimental site and a small glasshouse, while the dam, its feeder streams and their catchments and the irrigation settlement downstream all offer additional scope for research. A small electronic computer has been obtained and an experimental workshop is being developed. Certain field investigations must of necessity be carried out elsewhere.

THE RESEARCH PROGRAMME

The research programme of the Institute covers virtually all phases of the hydrological cycle, encompassing as it does research on the quantitative and qualitative occurrence of water, its development and use.

Hydrometeorology

Hydrologically the atmosphere is regarded as a source of water with a considerable potential for development. The Institute is therefore collaborating actively with the Weather Bureau in a study of the hydrological consequences of attempts to stimulate rainfall or prevent hail.

The feasibility of extracting water from the cloud cap on certain mountain peaks by erecting condensation screens is being studied in a pilot project at Mariepskop in the Eastern Transvaal. A statistical study of the effect of altitude and locality factors on mean annual rainfall is being carried out. Likewise a study of the intensity- frequency distribution of rainfall and changes in the relationship with time.

Surface water

The combined run-off of all rivers in South Africa is estimated to average 52000 million m³ per annum, equivalent to 8,1 per cent of the mean annual rainfall. That only about 18 per cent of the available surface water is delivered to consumers is due to a number of factors, each of them a challenge to research.

On average about 27 per cent of the water contained in existing storage dams evaporates. Research on means of reducing this major loss of water is being actively pursued.

Then again, the flow of many rivers is highly variable. For example, in October 1966 the flow in the Orange River at the site of the present Hendrik Verwoerd Dam dropped to less than 1 m³ per second. Four months later it was a raging torrent of 8000 m³ per second- the second highest flood in 50 years.

Some 270 million m³ of sediment is transported annually by rivers in South Africa, resulting in serious loss in dam capacity. A co-ordinated research programme is being formulated covering not only the study of erosion, deposition and transport of sediment and the propagation of density currents in dams but also the evaluation of the effects of land management and soil conservation works on the sediment contents of rivers.

By the turn of the century 50 per cent of the surface run-off will have to be delivered to consumers to meet their requirements. Much research will have to be done during the next two decades to reach this target.

Groundwater

About 10 per cent of South Africa's water consumption is derived from ground water, most of it being used for irrigation. Not enough is known about this valuable but limited source of water. Although there are few major water-bearing geological formations in South Africa, maximum use will have to be made of the available resources especially in the drier areas. Research will be concentrated on resource assessment, natural and artificial recharge, yield evaluation and optimum management.

Water quality

Inevitably, more use will have to be made of water resources of poor quality. Man-induced pollution will aggravate the problem. Surface and ground water will have to be monitored to determine the nature, degree and extent of contamination so that the causes can be established and remedial action taken in time. The extensive limnological survey of all major fresh water bodies in South Africa will continue.

Catchment management

Agricultural development, afforestation, soil conservation works and other land management practice, are having an increasing effect on the hydrology of large areas of South Africa. While they generally ensure maximum utilisation of the available water they may have a detrimental effect on the supply of water to the major urban and industrial areas. Where a conflict of interest arises, economic assessments of optimum development will have to be based on quantitative evaluation of the hydrological effects of the various proposals. Research in this direction will be greatly expanded.

Hydrological techniques

Sophisticated techniques and instruments are required for more refined water resource evaluation. Use of radioactive and stable isotopes and the radioactivation of micro constituents can provide valuable clues as to the origin and rate of replenishment of ground water supplies. The large number of routine water analyses that will have to be carried out will necessitate the acquisition of equipment that can perform these analyses speedily and accurately.

Multidisciplinary research

Covering as it does such a wide field, hydrological research cannot be conducted in isolation. The close ties between the Hydrological Division of the Department of Water Affairs and the Atomic Energy Board, the CSIR, the universities and other government departments will be strengthened in the years to come.

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DIE HIDROLOGIESE NAVORSINGSINSTITUUT

Die Hidrologiese Navorsingsinstituut is een van die min organisasies van sy soort in die wereld.

Aangesien die basiese hidrologiese probleem in Suid-Afrika die gebrek aan voldoende water is, is dit paslik dat die Instituut gelee is in 'n taamlik droe gebied van gras en bosse wat tipies van 'n groot gedeelte van suidelike Afrika is. Die navorsingsresultate by die Instituut behaal, behoort dus van wye toepassing te wees.

Ligging

Die Instituut is minder as 30 km vanaf Pretoria gelee met 'n uitsig oor die Roodeplaatdam in die Pienaars-rivier, 'n sytak van die Krokodilrivier wat noordwaarts vloei. Die dam het 'n net to kapasiteit van 41,9 miljoen m³ en word gevoed deur drie strome afkomstig van 'n opvanggebied van 668 km², met 'n gemiddelde jaarlikse afloop van ongeveer 20 miljoen m³.

Ontwerp

Met die ontwerp van die gebou kan die argitekte gelukkig word, nie slegs omdat dit goed by die mooi natuuumgewing pas nie maar ook omdat dit funksioneel en prakties beplan is. Aangesien hidrologie 'n vinnig ontwikkelende veld van die wetenskap is met veel vertakkinge, is een van die hoofvereistes dat die gebou aanpasbaar moet wees aan veranderde vereistes en nie verouderd sal raak nie. Hieraan is voldoen deur die gebruik van verskuifbare skeidsmure vir meeste van die binnemure.

Die kantore is op die grondvloer in die voorste gedeelte van die gebou met die algemene fasiliteite soos 'n klein lesingsaal, konferensiekamer, biblioteek, tekenkamer en 'n vergadersaal direk daarbo. Die agterste gedeelte van die gebou bestaan uit laboratoria. Die indeling van die ruimte en die plasing van die laboratoriumbanke kan maklik verander word as gevolg van die

gebruik van verskuifbare binnemure en die spasiering van diens-koppings op afstande van 3 m van mekaar. In hierdie gedeelte van die gebou is daar ook 'n groot vertrek vir modelstudies en 'n klein geïsoleerde kamer waarvan die temperatuur en vogtigheid verander kan word. Daar is toegang tot twee gedeeltes van die dak waarop instrumente gemonteer kan word.

Vier diensgange verbind die kantoorblok van die gebou met die laboratoriumblok. Elke navorsingsgroep beskik dus oor kantore en laboratoria wat verbind is met 'n diensgang en die gebou is dus uiters funksioneel. Die vloeroppervlakte van die gebou beslaan in die geheel ongeveer 2200 m².

Die natuurlike ruwe klip wat vir die fondament en symure gebruik is, asook die kolomvormige steenwerk van die gewel en voor die vensters aan die westekant, vorm 'n harmoniese eenheid met die onmiddellike omgewing. Deur die gebruik van materiaal met 'n duur-same afwerking en baie glas word die onderhoudskoste tot 'n minimum beperk. Afgesien van die mooi uitsig oor die dam is die groot rotslaag in die binnehof ook 'n treffende kenmerk van die Instituut. Om nog beter aan te pas by die natuurlike omgewing word slegs inheemse bome, aalwyne, vetplante en blomme om die gebou geplant.

Ander fasiliteite

Die navorsingsaktiwiteite is nie slegs tot die laboratoria beperk nie. Aan die agterkant van die gebou is 'n eksperimentele terrein met 'n glashuis, terwyl die dam, die strome wat daarin vloei, hul opvanggebiede en die besproeiingsnedersetting onderkant die dam ruim geleentheid vir navorsing bied. 'n Klein elektroniese rekenaar is aangekoop en 'n eksperimentele werkswinkel word ontwikkel. Sekere veldwerk word noodwendig elders uitgevoer.

DIE NAVORSINGSPROGRAM

Die navorsingsprogram van die Instituut dek feitlik alle fases van die hidrologiese kringloop. Dit sluit na- vorsing op die kwantitatiewe en kwalitatiewe voorkoms van water en die ontwikkeling en gebruik daarvan in.

Hidrometeorologie

Die atmosfeer word beskou as 'n waterbron met 'n aansienlike ontwikkelingspotensiaal. Die Instituut werk derhalwe aktief saam met die Weerburo in 'n studie van die hidrologiese gevolge van reenvalstimulasie en haelvoorkoming,

Die moontlikheid van wateronttrekking uit wolke op sekere bergpieke deur middel van kondensasieskerms word ondersoek in 'n projek te Mariepskop in die Oos- Transvaal, 'n Statistiese ondersoek na die invloed van hoogte en liggingsfaktore op die gemiddelde jaarlikse reenval word onderneem asook 'n studie na die intensiteit-frekwensieverspreiding van reenval en moontlike ver- anderings in hierdie verhouding met verloop van tyd,

Oppervlakwater

Die totale jaarlikse afloop van al die riviere in Suid-Afrika is na beraming 52000 miljoen m³. Dit is gelyk- staande aan 8,1 persent van die gemiddelde jaarlikse reenval. Verskeie faktore is daarvoor verantwoordelik dat slegs ongeveer 18 persent van die beskikbare opper- vlakwater aan verbruikers gelewer word. Elkeen van hierdie faktore bied 'n uitdaging aan die navorser.

Ongeveer 27 persent van die water in die bestaande opgaardamme verdamp. Intensiewe navorsing word gedoen in 'n poging om hierdie aansienlike verlies te verminder.

Voorts is die vloei van baie riviere hoogs veranderlik. In Oktober 1966 het die vloei van die Oranjerivier by die terrein van die huidige Hendrik Verwoerddam byvoorbeeld gedaal tot minder as 1 m³ per sekonde. Vier maande later was dit 'n tierende stroom van 8000 m³ per sekonde—die tweede hoogste vloei in 50 jaar.

Ongeveer 270 miljoen m³ slik word jaarliks deur die riviere in Suid-Afrika afgevoer, as gevolg waarvan die damme erg toeslik. 'n Gekoördineerde navorsings- program word tans geformuleer om erosie, sliksvervoer en -afsettig en die ontstaan van digtheidstrome in damme te bestudeer, asook die invloed van grondbestuur en grondbewaringswerke op die slikinhoud van riviere.

Teen die einde van die eeu sal 50 persent van die afloop 'Nater vir verbruik benodig word. Intensiewe navorsing sal derhalwe in die volgende 20 jaar gedoen moet word om aan hierdie vereiste te kan voldoen.

Grondwater Ongeveer 10 persent van die water wat in Suid-Afrika verbruik word, is grondwater. Dit word hoofsaaklik vir besproeiing gebruik. Nog te min is bekend oor hierdie waardevolle dog beperkte waterbron. Alhoewel daar min geologiese formasies in Suid-Afrika is wat groot hoeveelhede water lewer, is optimale benutting van hierdie bronne veral noodsaaklik in die droe streke. Navorsing sal toegespits word op ramings van die omvang van die grondwaterbronne, kunsmatige en natuurlike aanvulling, leweringsbepalings en optimale bestuur.

Waterkwaliteit Dit is onvermydelik dat al hoe meer gebruik gemaak sal moet word van waterbronne van 'n relatief swak gehalte. Besoedeling wat deur die mens veroorsaak word sal die probleem vererger. Sowel rivier- as grond- water sal gereeld gemonster moet word om die aard, graad en omvang en dus ook die oorsaak van besoedeling te bepaal sodat die nodige voorsorgmaatreels betyds getref kan word. Die uitgebreide limnologiese opname sal voortgesit word.

Grondbenuttingspraktyke

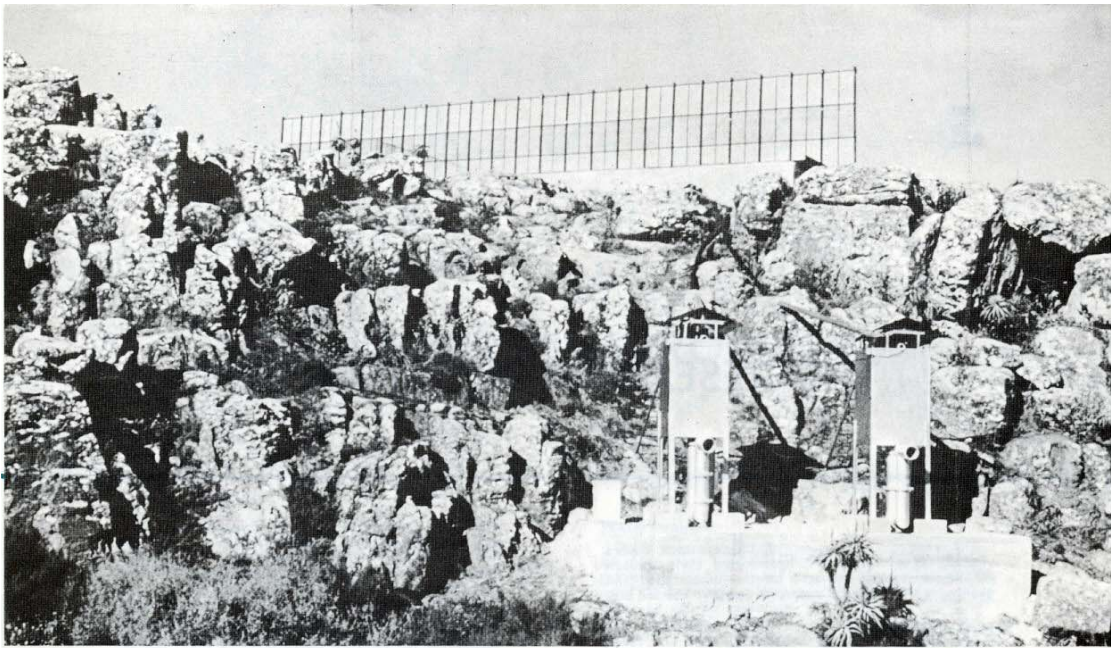
Boerderyontwikkeling, bebossing, grondbewarings- werke en ander grondbenuttingspraktyke het 'n toenemende invloed op die hidrologie van groot gebiede in Suid-Afrika. Hierdie praktyke verseker gewoonlik die maksimum benutting van die beskikbare water maar mag die toevoer van water na die stedelike en nywer- heidsgebiede nadelig tref. In sodanige gevalle van botsende belange sal ekonomiese bepalings van optimale benutting gegronde moet wees op 'n kwantitatiewe waardebeoordeling van die hidrologiese uitwerking van die verskillende voorstelle. Navorsing in hierdie verband sal aansienlik uitgebrei word.

Hidrologiese tegnieke

Verfynde tegnieke word vir die noukeuriger bepaling van waterhulpbronne benodig. Die gebruik van radio- aktiewe en stabiele isotope asook die radioaktivering van mikro-bestanddele kan belangrike leidrade verskaf tot die oorsprong en aanvullingstempo van grondwater- voorrade. Die groot aantal wateranalises wat gedoen sal moet word vereis toerusting wat die ontledings vinnig en akkuraat kan doen.

Die wye veld

Omdat dit so 'n wye veld dek moet hidrologiese navorsing in noue voeling met ander vakrigtings bly. Derhalwe sal die noue bande tussen die Afdeling Hidro- logie van die Departement Waterwese en die Raad op Atoomkrag, die WNNR, die universiteite en ander staatsdepartemente in die toekoms verstewig word.



Onderskepping van water uit newellae. Gaasskerms is by Mariepskop in Transvaal opgerig om hulle doeltreffendheid te bepaal om water uit lae miswolke te onttrek.
Interception of water from low clouds. Mesh screens have been erected at Mariepskop in the Transvaal to determine their efficiency in abstracting water from mist and low clouds.



Watervlakmeetapparaat by Sibayimeer.
Water level recorder at Lake Sibayi.