



## **water & sanitation**

Department:  
Water and Sanitation  
REPUBLIC OF SOUTH AFRICA

EdTM

Enquiries: L Lusenga  
Telephone: 012 336 7250  
Reference: 7/7/1/5/3

**MINISTER OF WATER AND SANITATION**

**NATIONAL ASSEMBLY: QUESTION 1595 FOR WRITTEN REPLY**

A draft reply to the above mentioned question asked by Mr L J Basson (DA) is attached for your consideration.

**DIRECTOR-GENERAL**

DATE: 21/6/16

~~DRAFT REPLY APPROVED/AMENDED~~

**MRS NP MOKONYANE**  
**MINISTER OF WATER AND SANITATION**

DATE: 06.06.16

NATIONAL ASSEMBLY

FOR WRITTEN REPLY

QUESTION NO 1595

DATE OF PUBLICATION IN INTERNAL QUESTION PAPER: 27 MAY 2016  
(INTERNAL QUESTION PAPER NO. 17)

**1595. Mr L J Basson (DA) to ask the Minister of Water and Sanitation:**

- (1) Whether any South African companies were considered to develop desalination plants along all coastal communities to boost water supply before a partnership was struck around 11 May 2016 with the Islamic Republic of Iran to develop the specified plants; if not, why not; if so,
- (2) why did she choose to partner with the Islamic Republic of Iran when many local jobs could have been created if a South African company was to develop the specified plants;
- (3) whether any studies were conducted by her department before the specified partnership was struck with Iran; if not, why not; if so, (a) what are the relevant details, (b) what were the outcomes of such studies and (c) who was consulted in this regard?

NW1765E

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**REPLY:**

- (1) No. No specific South African or Iranian companies were approached or selected for partnership on desalination. My Department has been working with various active actors nationally and internationally to examine the viability of desalination as an option in South Africa. Refer to **Annexure A** for the signed agreement.
- (2) My Department's International Engagement with Iran is based on the Bi-National Relations led by the Department of International Relations and Cooperation on issues of national interest for the benefit of the water sector.
- (3) Yes, my Department through, the Water Research Commission (WRC) conducted various studies over time to establish facts on the viability and benefits of desalination in the coastal areas of our country. The relevant details are contained in the study reports or outcomes backed by years of research by the WRC. Different actors and organisations and countries working on desalination were consulted by WRC both locally and internationally. Refer to **Annexure B**.

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**MEMORANDUM OF UNDERSTANDING**

**BETWEEN**

**THE GOVERNMENT OF THE  
REPUBLIC OF SOUTH AFRICA**

**AND**

**THE GOVERNMENT OF THE  
ISLAMIC REPUBLIC OF IRAN**

**ON**

**COOPERATION IN THE FIELD OF WATER  
RESOURCES MANAGEMENT**

## **PREAMBLE**

The Government of the Republic of South Africa and the Government of the Islamic Republic of Iran (hereinafter jointly referred to as "Parties" and separately as a "Party");

**RECOGNISING** that the Parties are facing common challenges with respect to the utilisation and sustainable development of water resources;

**CONVINCED** of the potential for bilateral scientific, technical, managerial, and research cooperation in the field of water resources;

**CONSIDERING** that the mutual exchange of ideas and knowledge can strengthen the relationship of friendship and collaboration in the sphere of water resources, especially in matters regarding water resources management for the benefit of citizens in the rural and urban areas in the Republic of South Africa;

**HEREBY AGREE** as follows:

## **ARTICLE 1 OBJECTIVE**

The objective of this Memorandum of Understanding (hereinafter referred to as "the MoU") is to establish cooperation between the Parties in the efficient utilisation, management and sustainable development of water resources and to establish a long-term cooperative relationship on the basis of equity and mutual benefit.

## **ARTICLE 2 COMPETENT AUTHORITIES**

The competent authorities responsible for implementation of this MoU shall be—

- (a) in the case of the Government of the Republic of South Africa, the Department of Water and Sanitation; and
- (b) in the case of the Islamic Republic of Iran, the Ministry of Energy.

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**ARTICLE 3**  
**AREAS OF COOPERATION**

The areas of cooperation shall include, but not be limited to -

- (a) integrated water resource management;
- (b) water sector oversight and regulation;
- (c) water quality management and water treatment;
- (d) water demand management and water use efficiency;
- (e) water infrastructure development;
- (f) water-related research and innovation; and
- (g) trade in technologies in water and waste water industry.

**ARTICLE 4**  
**FORMS OF COOPERATION**

The forms of cooperation shall include, but not be limited to-

- (a) the exchange of information by means of documentation, knowledge, experience, expertise and achievements in the areas referred to in Article 3;
- (b) the exchange of governmental and commercial delegations for policy dialogue and project negotiations;
- (c) organising technical training, seminars or study tours in each country on subjects of mutual interest;
- (d) the exchange of information on projects open to international bidding and encouraging collaboration between companies of the two countries in jointly undertaking water infrastructure projects; and
- (e) promoting joint ventures between South African and Iranian planning, design and construction management companies.

**ARTICLE 5**  
**ESTABLISHMENT OF COMMISSION**

Upon the entry into force of this MoU, the Parties shall establish the Republic of South Africa-Islamic Republic of Iran Commission (hereinafter referred to as "the Commission") to promote the implementation of this MoU.

*JWP/M*  
X

**ARTICLE 6**  
**COMPOSITION OF COMMISSION**

The Commission shall consist of two (2) delegations representing each of the Parties.

- (1) Each delegation shall consist of not more than three (3) members to be appointed by the Party concerned, one of whom shall be designated by the Party as leader of its delegation.
- (2) The leader of each delegation may co-opt not more than three (3) persons as advisors to his or her delegation, who may take part in the discussion at any meeting of the Commission.
- (3) The Commission shall meet at least once a year, but extra-ordinary meetings may be convened, as may be agreed upon by the leaders of the delegations whenever circumstances require. The venue of all meetings shall alternate between South Africa and Iran, unless the leaders of the respective delegations determine otherwise in relation to a particular meeting.
- (4) The leader of the delegation of the Party hosting a particular meeting of the Commission shall, in respect of that meeting, be chairperson, and shall be responsible for the preparation and timely distribution of the minutes, as well as for ensuring the availability of a suitable venue.
- (5) Each delegation shall consist of at least two (2) delegates in order to form a quorum for any meeting. All decisions of the Commission shall be taken on the basis of consensus.

**ARTICLE 7**  
**FUNDING FOR COOPERATIVE PROJECTS**

- (1) Each Party shall finance the costs of international travel, accommodation, food, and daily subsistence allowances incurred by its own visiting delegation.

*[Handwritten signature]*  
*[Handwritten initials]*

- (2) Technical experts invited by one Party to provide technical assistance to the other Party shall be financed by the inviting Party unless a third party will finance the costs for such assistance.
- (3) Funding for commercial and technical cooperative projects shall be decided through mutual consultation between the Parties in accordance with the specific nature of the projects.

#### **ARTICLE 8 CONFIDENTIALITY**

Each Party shall respect the terms and conditions, where appropriate, relating to the restrictive use, and the restrictive transfer to a third party of technical documents, patents or other technical data and knowledge (e.g. in the framework of intellectual property rights) provided by the other Party. There will be no legal liability for either Party arising from the exchange of information between the Parties.

#### **ARTICLE 9 SETTLEMENT OF DISPUTES**

Any dispute between the Parties arising out of the interpretation, application or implementation of the provisions of this MoU shall be settled amicably through consultation or negotiations between the Parties.

#### **ARTICLE 10 AMENDMENT**

This MoU may be amended by mutual consent of the Parties through an Exchange of Notes between the Parties through the diplomatic channel.

A handwritten signature and initials are present in the lower right quadrant of the page. The signature appears to be a stylized name, possibly 'M. P. M.', written in dark ink. Below the signature, there are some faint, illegible markings.

**ARTICLE 11**  
**ENTRY INTO FORCE, DURATION AND TERMINATION**

- (1) This MoU shall enter into force on the date of signature thereof.
- (2) This MoU shall remain in force for a period of five (5) years, whereafter it shall be automatically renewed for a further period of five (5) years, unless terminated by the Parties in accordance with sub-Article (3).
- (3) This MoU may be terminated by either Party giving at least six (6) months' written notice in advance to the other Party through the diplomatic channel of its intention to terminate this MoU.
- (4) Termination of this MoU does not affect the completion of obligations or programmes of any separate agreement, contract or programme concluded in terms of this MoU.

**IN WITNESS WHEREOF** the undersigned, being duly authorised thereto by their respective Governments, have signed and sealed this MoU in two originals in the English and Farsi languages, both texts being equally authentic.

DONE at TEHRAN on this 24 day of APRIL 2016



**FOR THE GOVERNMENT OF THE  
REPUBLIC OF SOUTH AFRICA**



**FOR THE GOVERNMENT OF THE  
ISLAMIC REPUBLIC OF IRAN**





یادداشت تفاهم همکاری

بین

دولت جمهوری آفریقای جنوبی

و

دولت جمهوری اسلامی ایران

در زمینه مدیریت منابع آبی



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## مقدمه

دولت جمهوری آفریقای جنوبی و دولت جمهوری اسلامی ایران (که از این پس همراه یکدیگر "طرفین" و بصورت مجزا "طرف" نامیده می شوند)؛

با اذعان اینکه "طرفین" در خصوص استفاده از منابع آبی و توسعه پایدار این منابع با چالشهای مشترکی روبرو هستند؛

با اعتقاد به این امرکه زمینه بالقوه فراوانی برای همکاریهای دوجانبه علمی، فنی، مدیریتی و مطالعاتی در خصوص منابع آبی بین دو کشور وجود دارد؛

با توجه به این واقعیت که تبادل دوجانبه نظرات و دانش میتواند به تحکیم روابط دوستانه و همکاریهای فیما بین در حوزه منابع آبی و عالی الخصوص در ارتباط با موضوعات مدیریت منابع آبی در راستای منافع شهروندان مناطق روستایی و شهری کشور جمهوری آفریقای جنوبی منجر گردد؛

در موارد زیر توافق نمودند:

## ماده 1

### هدف

هدف این یادداشت تفاهم (که از این پس "یادداشت تفاهم حاضر" نامیده میشود) برقراری همکاری بین طرفین جهت استفاده کارآمد از منابع آبی و مدیریت و توسعه پایدار این منابع و نیز ایجاد روابطی بلند مدت مبتنی بر همکاری بر اساس اصل برابری و منافع دوجانبه می باشد.

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## ماده 2

### نهاد های صلاحیتدار

نهادهای صلاحیتدار مسئول اجراء "یادداشت تفاهم حاضر" عبارتند از

(الف) از طرف دولت جمهوری آفریقای جنوبی- وزارت آب و فاضلاب؛ و

(ب) از طرف دولت جمهوری اسلامی ایران- وزارت نیرو

NDM

### ماده 3

#### زمینه های همکاری

زمینه های همکاری از جمله موارد زیر را شامل میگردند:

الف) مدیریت یکپارچه منابع آب؛

ب) مدیریت کیفیت آب و تصفیه و فرآوری آب؛

ج) مدیریت تقاضای آب و استفاده کارآمد از آب؛

د) توسعه زیرساخت منابع آبی؛ تجهیزات و توسعه صنعتی/ کارخانجات یا ایستگاههای مربوطه؛

ه) تحقیق و نوآوری در زمینه آب؛ و

و) تجارت در زمینه فنآوریهای آبی و تجهیزات صنعتی مربوط به فاضلاب از جمله لوله های مربوطه؛

### ماده 4

#### شیوه همکاری

شیوه همکاری از جمله موارد زیر را شامل میگردند:

الف) تبادل اطلاعات از طریق تبادل اسناد، تجربیات، تخصص و اطلاعات مربوط به موفقیتهای کسب شده در حوزه های مورد اشاره در ماده 3؛

ب) تبادل هیئتهای دولتی و تجاری برای انجام گفتگوهای مربوط به سیاستهای مورد نظر و بحث در خصوص موضوعات مورد علاقه؛

ج) برگزاری دوره های آموزشی فنی، سمینارها و سفر های مطالعاتی در هر کشور بر اساس موضوعات مورد علاقه؛

د) تبادل اطلاعات در خصوص پروژه های به مناقصه گذاشته شده در سطح بین المللی و تشویق همکاری میان شرکتهای دو کشور بمنظور اجراء مشترک پروژه های زیر بنایی بخش آب؛ و

ه) ارتقاء انجام سرمایه گذاری مشترک بین شرکتهای ساختمانی، برنامه ریزی، طراحی و مدیریتی آفریقای جنوبی و ایران.

## ماده 5

### تشکیل کمیته مشترک آب

بمنظور ارتقاء روند اجراء یادداشت تفاهم حاضر و بمحض به اجراء درآمدن مفاد آن طرفین باید نسبت به تشکیل کمیته مشترک آب جمهوری آفریقای جنوبی - جمهوری اسلامی ایران (که از این پس "کمیته" نامیده میشود) اقدام نمایند.

## ماده 6

### ترکیب کمیته

کمیته هیئتهای نمایندگی طرفین را که بشرح زیر معرفی میگردد شامل خواهد گردید:

1- هر هیئت حداکثر سه نفر را که از سوی هر طرف مربوطه معرفی و تعیین میگردد شامل میگردد. یکی از این سه نفر نیز از سوی هر طرف بعنوان رئیس آن هیئت منصوب می شود.

2- رئیس هر هیئت مختار است حداکثر سه نفر را بعنوان مشاور(ین) هیئت مربوط بخود معرفی نماید و این مشاور(ین) می توانند در جلسات بحث و تبادل نظر کمیته حضور بهم رسانند.

3- کمیته حداقل سالی یکبار در هر یک از دو کشور به تناوب تشکیل جلسه خواهد داد. در این خصوص لازم بذکر است بر حسب شرایط و ضرورت و با موافقت رؤسای هیئتها جلسات ویژه و فوق العاده کمیته قابل برگزاری خواهند بود. بجز در مواردی که رؤسای هیئتها در خصوص برگزاری جلسات خاص بنحو دیگری تصمیم بگیرند

محل برگزاری کلیه جلسات بطور متناوب در کشور جمهوری آفریقای جنوبی و کشور جمهوری اسلامی ایران خواهد بود.

4- رئیس هیئت طرف میزبان هر جلسه برگزار شده ریاست آن جلسه را بر عهده داشته و همچنین آماده سازی مقدمات جلسه مربوطه، توزیع بموقع متن مربوط به جلسه و نیز کسب اطمینان در خصوص پیش بینی محل مناسب برگزاری جلسه از جمله وظایف وی محسوب میگردند.

5- حد نصاب مربوط به برگزاری و رسمیت هر جلسه برای هر هیئت حداقل دو عضو خواهد بود. تصمیم گیریها در طی جلسات بر اساس اجماع اعضاء صورت خواهد پذیرفت. در صورتیکه در خصوص موضوعی کمیته در اخذ اجماع ناکام گردد موضوع مربوطه باید جهت بررسی بیشتر از طریق رؤسا هر طرف به طرفین منعکس گردد.

## ماده 7

### تامین بودجه برای پروژه های همکاری

1- هر طرف مسئولیت تامین هزینه های سفرهای بین المللی، محل اقامت، غذا و سایر هزینه ناشی از سفر هر هیئت مربوط بخود را بر عهده خواهد داشت.

2- تامین هزینه های ناشی از دعوت کارشناسان فنی از سوی یک طرف جهت ارائه کمک فنی به طرف دیگر باید از سوی طرف دعوت کننده تامین گردد مگر در مواردی که طرف سومی نسبت به تامین اینگونه هزینه ها اقدام نماید.

3- نحوه تامین بودجه پروژه های تجاری و فنی ناشی از همکاریهای مورد نظر از طریق رایزنی دوجانبه بین طرفین و براساس طبیعت خاص هر پروژه تصمیم گیری شده و بمورد اجرا گذاشته میشود.

## ماده 8

## حفظ اسرار

مفاد مربوط به این یادداشت تفاهم ، مدارک و اسناد فنی و سایر داده ها و دانش فنی مبادله شده بین طرفین مشمول قانون حق مالکیت فکری بوده و طرفین حق واگذاری آن را به طرف سوم ندارند.

## ماده 9

### حل و فصل اختلافات

هرگونه اختلاف ناشی از تفسیر، کاربرد و یا اجرای مفاد یادداشت تفاهم حاضر بشکلی مودت آمیز از طریق رایزنی و گفتگو بین طرفها حل و فصل خواهد گشت.

## ماده 10

### اطلاعات

هرگونه اعمال اصلاحات در خصوص مفاد یادداشت تفاهم حاضر بر اساس رضایت دوجانبه و با تبادل یادداشت بین طرفها از طریق مجاری دیپلماتیک امکانپذیر خواهد بود.

## ماده 11

### زمان اجراء، مدت اعتبار و خاتمه

- 1- یادداشت تفاهم حاضر از زمان امضاء آن لازم الاجراء خواهد بود.
- 2- یادداشت تفاهم حاضر برای یک دوره 5 ساله معتبر بوده و پس از اتمام این دوره و انجام بررسیهای مورد نظر برای یک دوره 5 ساله دیگر قابل تمدید خواهد بود مگر اینکه از سوی طرفین و مطابق با بند فرعی 3 ذکر شده در زیر مورد فسخ آن اعلام گردد.

3-فسخ یادداشت تفاهم حاضر از سوی هر یک از طرفین با ارسال پی یادداشت مکتوب به طرف دیگر از طریق مجاری دیپلماتیک مبنی بر فسخ خود جهت انجام این امر حداقل ششماه قبل از تاریخ مورد نظر برای فسخ امکانپذیر خواهد بود.

4-فسخ و یا اتمام اعتبار یادداشت تفاهم حاضر بر تکمیل تعهدات یا برنامه های پیش بینی شده در موافقتنامه ها، قرار دادها و یا برنامه های منعقد شده بر طبق شرایط یادداشت تفاهم حاضر بلا اثر خواهد بود.

با تایید و تصدیق مراتب فوق امضاء کنندگان ذیل بر اساس اختیارات اعطاء شده بدانها از سوی دولت های متبوعشان نسبت به امضاء و مهر یادداشت تفاهم حاضر در دو نسخه اصلی به زبانهای انگلیسی و فارسی که همگی از اعتبار یکسان برخوردارند اقدام مینمایند.

امضاء شده در روز.....ماه.....سال 2016.

از طرف دولت جمهوری اسلامی ایران



از طرف دولت جمهوری آذربایجان  
جنوبی



## **DESALINATION, RECLAMATION AND WATER REUSE R&D**

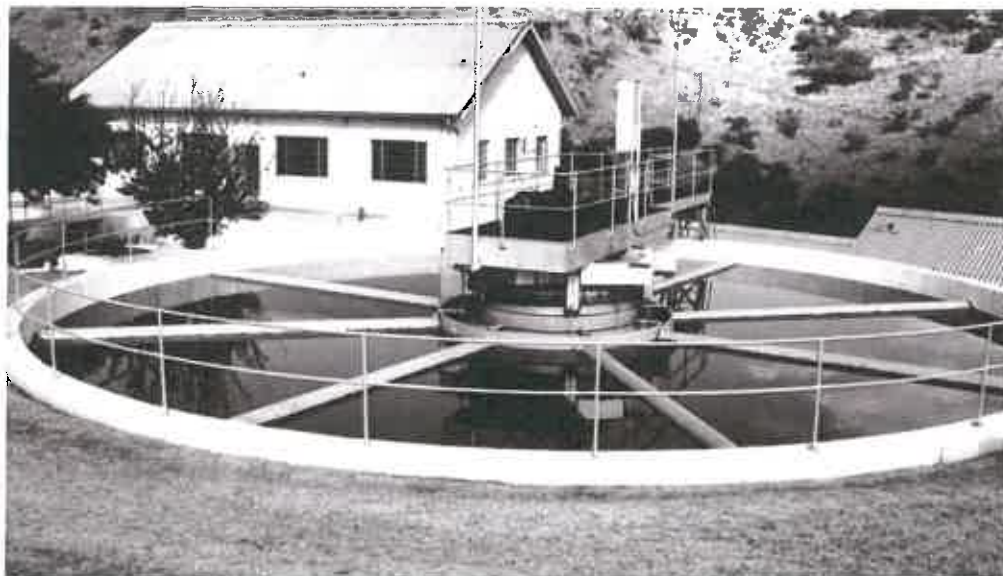
Water reclamation and reuse has been studied in the region since the 1950s, which has led to the first direct water reclamation plant being built in Windhoek. Ongoing research and development at Windhoek has led to this plant being internationally considered as an effective multi-barrier treatment system.

Early work was done by the CSIR in early 1960s (Windhoek requirements); Windhoek direct reuse treatment plant was commissioned Oct '68.

- 💧 CSIR Stander demo plant 4.5 Ml/d 1970 Pretoria (direct reuse, for research)

Soon after the WRC was established in 1971, it set out to look at furthering research on the technology

- 💧 Test facility at Daspoort, Pretoria (photo below)
- 💧 Used the knowledge gained from the tests to upgrade the technology
- 💧 Process design manual for water reclamation in 1978



**Figure 1: WRC / CSIR pilot test at Daspoort**

In Southern Africa (and now also worldwide after the 2013 IWA Water Reuse Specialist Group conference in Windhoek), the City of Windhoek (CoW) and the original planners and researchers of



the Windhoek water reclamation project, are considered pioneers in direct potable reuse (DPR). The first direct potable reuse plant was commissioned in 1968 and was the result of severe droughts in the regions, with no other viable water sources for the city. This has remained unchanged up to the present time. As the first, and until very recently the only, DPR plant in the world, considerable research and development had taken place in Windhoek to study health impacts, process efficiency and water management strategies. This was extended even further after the construction and commissioning of the New Goreangab Water Reclamation Plant in 2002. After more than 40 years of operation of direct potable reuse in Windhoek, no adverse health effects have been experienced.

### Role of WRC in membrane research

The WRC has funded several projects on membrane research since its inception in 1971. However, most projects were funded after the establishment of a dedicated membrane programme in the early 90's. Sixty-six membrane projects were funded since 1993. Figure 2 represents the research that has been conducted as well as a number of ongoing projects. The WRC has funded almost 70 projects since the 1990s:

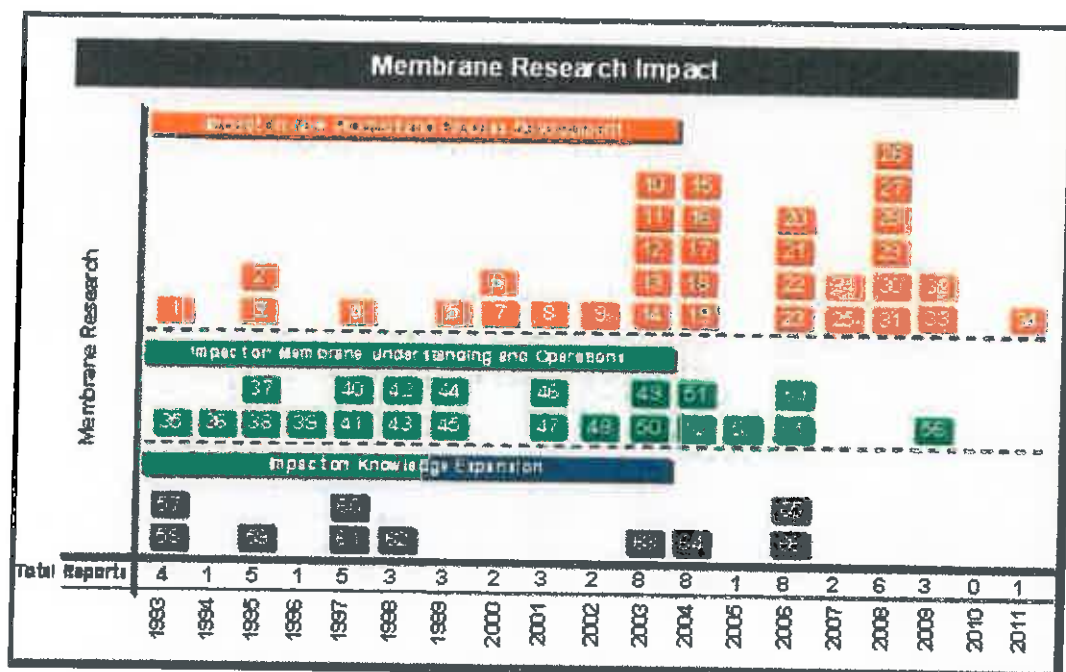


Figure 2: Membrane Research Impact Funded by the WRC

The research funded by the WRC has led to knowledge expansion. This knowledge and the applications thereof will further build the membrane industry in South Africa. An overview of the knowledge created is represented in Figure 3:

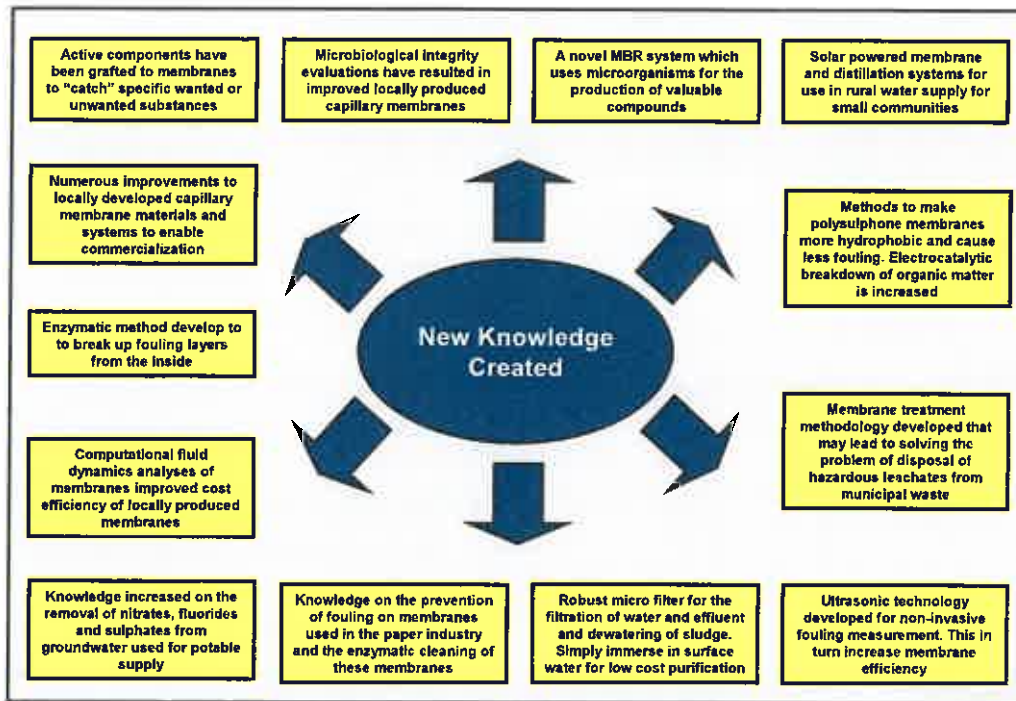


Figure 3: New Knowledge Created through WRC Funded Research Projects

### The history of membrane research in South Africa

The earliest fundamental membrane research in South Africa started in 1953 on electrodialysis (ED) systems and their membranes at the Council for Scientific and Industrial Research (CSIR). This research laid the foundation for a better understanding of the thermodynamic and physical processes involved in ED. Parchment paper membranes were developed and piloted for the low-cost desalination of brackish gold-mine underground waters. Initial research on polymeric membranes, utilising WRC funding, started in 1973 at the Institute for Polymer Research (IPS), University of Stellenbosch, leading to the establishment of the first local membrane manufacturing company in 1979.

The IPS developed low cost tubular RO and UF systems in the 1980s. The tubular UF systems were later successfully combined with anaerobic digestion and commercialised as the “ADUF” process. From humble beginnings, these activities have grown to the current situation where R&D on membranes is actively pursued not only at a number of tertiary educational institutions, but also by private companies and water and power utilities.

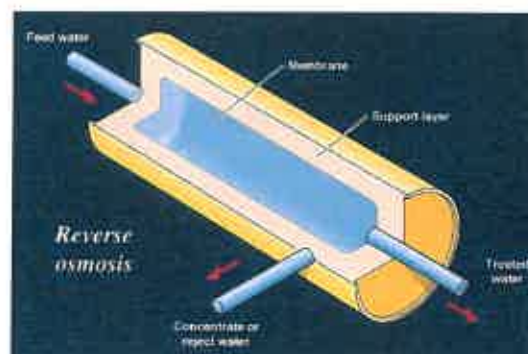
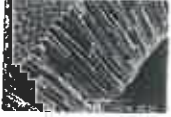





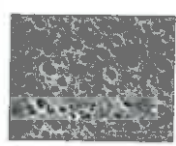



Figure 4: Reverse Osmosis Process

The table below gives an overview of some of the types of products that have been developed through research.

**Table 1: Products Developed through WRC Funded Research**

Some Products Developed through WRC Research		
	Type of Technology	Description
	<b>Ultrafiltration (UF) Membranes</b>	<ul style="list-style-type: none"> <li>• Used for producing ultra pure water</li> <li>• Able to remove bacteria from water</li> <li>• Ideal for rural water applications for small communities</li> </ul>
	<b>Reverse Osmosis (RO) Developments</b>	<ul style="list-style-type: none"> <li>• Used to desalinate water sources</li> <li>• Increase available water resources</li> </ul>
	<b>Woven Fibre Microfiltration (MF) membranes</b>	<ul style="list-style-type: none"> <li>• The tubular system consists of two layers of a woven polymer material, stitched together to form rows of parallel filter tubes, called a "curtain"</li> <li>• Liquid is fed from the inside and clear water permeates from the membrane (clarification process)</li> <li>• Can be used for sludge dewatering</li> <li>• A simplified, immersed, flat-sheet system was later developed for potable and industrial water treatment</li> </ul>
	<b>Electroconducting Membranes</b>	<ul style="list-style-type: none"> <li>• Membrane systems that use positive and negatively charged membranes to remove particles from the stream.</li> <li>• Some of the systems are able to produce sodium hypochlorite or ozone as by-products.</li> </ul>
	<b>Supported Liquid Membranes</b>	<ul style="list-style-type: none"> <li>• Shows the potential to extract metals such as nickel from liquid streams.</li> </ul>
	<b>Membrane Bioreactors (MBRs)</b>	<ul style="list-style-type: none"> <li>• Most of the studies are using the outer-skinless UF membrane as reactor (fungi are used in bioremediation of waste water). Flat-sheet woven microfilter units have lately showed great promise as inexpensive, robust, immersed MBRs.</li> </ul>
	<b>Membrane Fouling Studies</b>	<ul style="list-style-type: none"> <li>• Research on membrane fouling centres around three aspects: electromagnetic defouling; enzymatic and chemical defouling; as well as surface modification.</li> </ul>
	<b>Affinity Separation</b>	<ul style="list-style-type: none"> <li>• A process that involves extracting "wanted" elements from the stream through chemical reaction. It is being developed as an EDC detector.</li> </ul>
	<b>Nanostructured Membranes</b>	<ul style="list-style-type: none"> <li>• Nanotechnology can aid tailoring of membrane thickness, pore size</li> </ul>

		<p>distribution, permeability, and surface chemistry. Membrane design via templating chemistry allows entirely new and more effective membrane architectures to be engineered and developed. A new, nano-membrane has already been developed at UCLA which claims to provide RO quality water at much lower pressures.</p>
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Some of the major challenges facing research institutions in South Africa are how to 1) protect their intellectual property and 2) commercialise research. The figure below shows how the research process can eventually lead to benefits through project commercialisation. Additional funding for technology commercialisation and business skills development for researchers could significantly increase the successful commercialisation of research projects.

Some examples of how WRC research has led to commercial implementation in different situations are represented in Figure 5. Grahamtek was one of the biggest spin-offs of this investment. It was bought out by PUB Singapore and now operate under the name of NuWater. NuWater is nregaded as one of the leading technology supplier of desalination plants in the world today.

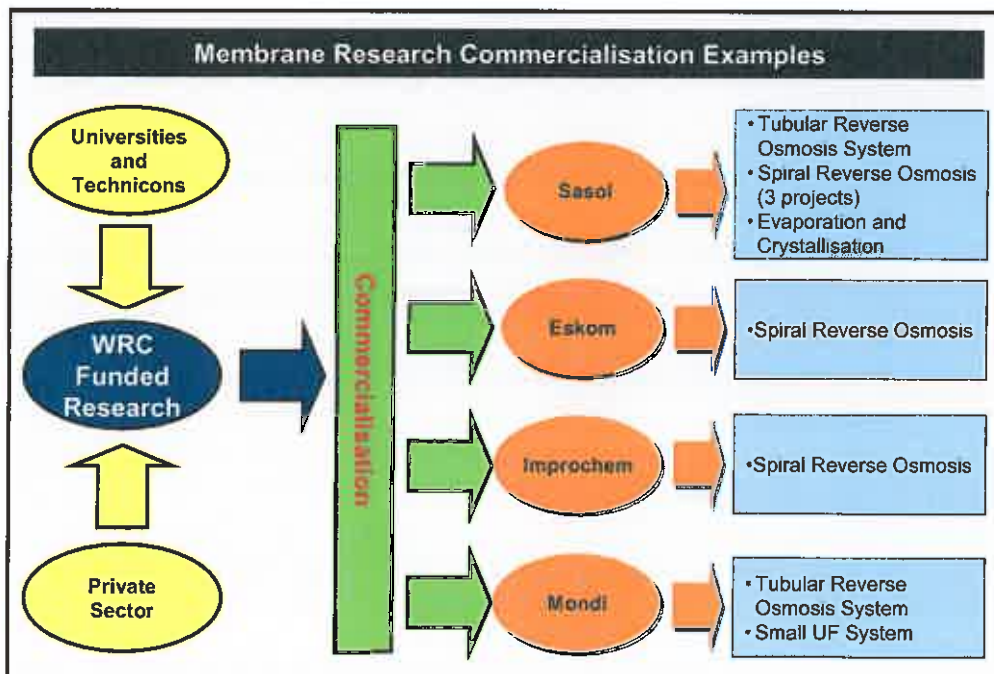


Figure 5: Membrane Commercialisation Examples

During this period of R&D development, the South African Government strategy was on building of bulk infrastructure such as dams and transfer schemes as a means to deal with droughts and water scarcity. Energy was a constraint, even then, as the membranes were not that efficient. Over the years this has changed and energy efficiency has improved, resulted in greater interest and uptake of desalination and reclamation option.

With foresight in 2006, the Water Research Commission and the Department of Water Affairs and Forestry jointly funded a study aimed at assessing the applicability and economic considerations of various options to desalinate water from the sea, brackish boreholes and other sources to produce drinking water in order to meet the rising demands of water supply. A guideline document (A desalination guide for South African municipal engineers - Research Report No.TT 266/06) - was produced from this study. The guideline provides guidance on desalination technologies that can currently be commercially implemented in South Africa to treat different saline water to drinking water standards; typical pre-treatment requirements, process selection and costing; pre- and post-treatment requirements; management of residuals; environmental considerations and operation and maintenance aspects.

During the 2009/10 drought in South Africa, a number of small scale desalination plants were commissioned as an emergency water supply measure. In 2012, the Water Research Commission funded a study that was aimed at investigating the sustainability of desalination (Cost and operational aspects of seawater desalination plants – Research Report No.TT 636/15; 637/15 and 638/15) as a water supply measure by looking at the planning and operational aspects of these plants and compile best practices and lessons thereof.

Other projects that have been recently funded include:

- Solar energy for desalination (ongoing)– K5/2467
- Brine management (ongoing) – K5/2576
- A comparative life cycle assessment (LCA) for the provision of potable water from alternative sources (seawater, wastewater and mining water) in South Africa – K5/1122

A national community of practice on desalination has already been established, where guidance and support is provided to municipalities on planning and the implementation of large scale water supply.

Future research areas include;

- Investigation of seawater desalination by using hybrid renewable energy technologies in South Africa
- Framing desalination within the water-energy-climate nexus – understanding the water and energy decisions within the context of desalination is important as it has significant climate impacts.
- Economic and technical assessment of current and emerging desalination technologies

#### **REPORTS AND GUIDELINES (RECENT)**

- A desalination guide for South African municipal engineers - Research Report No.TT 266/06
- Cost and operational aspects of seawater desalination plants – Research Report No.TT 636/15; 637/15 and 638/15
- A comparative life cycle assessment (LCA) for the provision of potable water from alternative sources (seawater, wastewater and mining water) in South Africa – K5/1122