1. **Report of the Portfolio Committee on Science and Technology on its International Study Tour to the Republic of Korea and Japan from 15 to 25 June 2018, dated 5 September 2018.**

The Portfolio Committee on Science and Technology, having conducted an international study tour to the Republic of Korea and Japan from 15 to 25 June 2018, reports as follows:

1. **Introduction**

A delegation of the Portfolio Committee on Science and Technology (the delegation) embarked on an international study tour to the Republic of Korea (Korea) and Japan from 15 to 25 June 2018.

Both Korea and Japan have, in a relatively short period of time, transformed their economies and the wealth of their nations by integrating science, technology and innovation (STI) into every aspect of their development trajectory.

South Africa, through the National Development Plan: Vision 2030 (the NDP), seeks to transform its economy and the livelihood of all citizens. The NDP asserts that STI is crucial for development since countries that have effectively alleviated poverty by growing their economies, have done so by investing in and developing strong STI environments and capabilities. Hence, the NDP advocates that South Africa’s system of science and innovation must be expanded and be more effective and that this requires South Africa to invest more in research and development (R&D), that STI institutions must improve the link between innovation and the productive needs of industry, and that Government should collaborate with the private sector to raise the level of R&D in companies.

* 1. **Purpose of the Study Tour**

The purpose of the study tour to Korea and Japan was to:

* Learn how STI policy planning and co-ordination was conducted;
* Learn best practice with regard to integrating STI into all sectoral development plans;
* Identify possible policy approaches that could be used to increase the level of R&D investment;
* Learn about the areas of STI co-operation with Korea and Japan; and how successful co-operation projects could be expanded and/or continued;
* Identify opportunities for human capacity development; and
* Gather information on how Parliament, through its oversight function, can ensure that STI is wholly integrated into all sectoral development plans and adequately resourced.
  1. **Delegation**

The delegation comprised of the following individuals:

**Members of Parliament**

Ms. L. Maseko (Chairperson) African National Congress (ANC)

Mr. N. Koornhof (Whip) ANC

Ms. N. Ndongeni ANC

Mr. M. Kekana ANC

Dr. A. Lotriet Democratic Alliance (DA)

Ms. C. King DA

Dr. S. Thembekwayo Economic Freedom Fighters (EFF)

**Parliamentary Support Staff**

Ms. S. Isaacs Committee Secretary

Dr. R. Osborne-Mullins Content Advisor

**Department of Science and Technology**

Mr. P. Masemola Parliamentary Liaison Officer

Ms. P. Mdaka Director: Overseas Bilateral Co-operation

1. **REPUBLIC OF kOREA**

The delegation was met by Mr. Gert du Preez, the Counsellor: Political and Chargé d’affaires from the South African Embassy, at Korea’s Incheon International Airport on 16 June 2018. The delegation stayed at the Hotel President in Seoul for the duration of their visit. The programme comprised of the following activities:

* 1. **Sunday, 17 June 2018**

Accompanied by Mr. Du Preez, the delegation visited the Lotte World Tower. At 123 floors and 554.5 metres tall, this Tower is the tallest in Korea, the 3rd tallest in Asia, and the 5th tallest in the World. While some opted to take the tour to the observation deck on the top floor of the Tower, others explored the Lotte World Centre and its surroundings.

The delegation then visited the Deoksugung Palace, a walled compound of palaces in Seoul that was inhabited by members of Korea's royal family during the Joseon monarchy. It is one of the "Five Grand Palaces" built by the kings of the Joseon Dynasty (1392 to 1897). Deoksugung, like the other "Five Grand Palaces" in Seoul, was intentionally heavily destroyed during the colonial period of Korea. Currently, only one third of the structures that were standing before the occupation remain. During the visit to Deoksugung Palace, the delegation witnessed the ceremonial changing of the Royal Guard in front of the Daehanmun Gate. The Royal Guard was responsible for opening and closing the palace gate during the Joseon Dynasty.

Thereafter, the delegation walked through Insa-dong, an area showcasing traditional Korean culture and crafts.

* 1. **Monday, 18 June 2018**
     1. **South African Embassy, Seoul**

The delegation was accompanied by Mr. Raymond Manzini (First Secretary: Political) to the Embassy, where they were met by Mr. Du Preez, Mr. Harold Manamela (Counsellor: Economic) and Ms. Daisy Ellen (Corporate Services Manager). Mr. Du Preez briefed the delegation on the political relationship between South Africa and Korea; specifically emphasising that the Joint Commission of Co-operation (JCC) signed in 2014, will have its first meeting in South Africa in 2018. In addition, South Africa and Korea have entered into 13 bilateral agreements to date.

Mr Manamela briefed the delegation on the state of Korea’s economy, which is driven by export-led growth. Since Korea does not have significant natural resources, it’s human capital is its most important resource. Education is; therefore, highly regarded by Korean society.

The Embassy actively promotes trade and investment between South Africa and Korea. These efforts have translated into a R28 billion investment from Korea, providing approximately 2 000 jobs in South Africa. However, there is no Free Trade Agreement (FTA) between the two countries, making South African products very expensive in Korea. On the continent, South Africa competes against Egypt, Kenya and Rwanda for Korean trade.

The Embassy briefing concluded with Mr. Du Preez reiterating the importance of the JCC to enhance trade and investment between Korea and South Africa.

* + 1. **Seoul National University**

The delegation, accompanied by Mr. Manzini, proceeded to a meeting at the Office of International Affairs, Seoul National University (SNU). The delegation met with Dr. Min Gyo Koo (Vice President: International Affairs), Dr. Suk Won Cha (Associate Dean: International Affairs) and Mr. Dongmyoung Lee (Director: International Education and Partnership).

Dr. Koo welcomed the delegation to SNU and invited the delegation to open discussions by providing some context to the visit. The Chairperson commenced discussions by explaining the functions of the Committee, the purpose of the visit, summarising South Africa’s science system and how the NDP advocates that R&D investment must be increased to realise the countries growth objectives.

Dr. Koo outlined the history and development of SNU, which is considered to be the most prestigious university in Korea. He emphasised the importance of having a diverse, well-educated workforce and stated that during the past few years the Korean government has concentrated on the potential challenges and opportunities of the Fourth Industrial Revolution (FIR) and what skills would be needed for the country to best take advantage of the opportunities and mitigate the potential threats.

Prompted by a question from the delegation with regard to how Koreans view the possibility of job losses due to the widespread application of Artificial Intelligence (AI), and a request for information on SNU’s Graduate School of Convergence Science and Technology that was established to address the skills requirements of the FIR, Drs. Koo and Cha, respectively, responded as follows:

* Koreans, due to the success of the Government’s information dissemination programmes on the FIR, believe there to be more opportunities/benefits associated with the FIR than threats. Koreans believe that AI will perform the less desirable tasks/jobs and that widespread automation will allow people to have more time for more important tasks/activities. Dr. Koo also expressed the opinion that the causality between the FIR and job losses has not been definitively established, and that the work of the humanities and social sciences will be central to exploring and understanding the FIR and its effect on humanity.
* With the advent of talks on the FIR, SNU established, 10 years ago, the Graduate School of Convergence Science and Technology as an experiment. The aim was to combine many different faculties in one environment to stimulate a creative and multi-pronged approach to problem-solving. The Graduate School of Convergence Science and Technology focusses on the education of and research in convergence methodology and technology, aiming to merge existing academic disciplines. The experiment has resulted in a globally-recognised Big Data Research Institute and SNU is also currently building a new Graduate School for Big Data. However, due to issues of management and administration, a large component of SNU’s faculty still favour decentralised departments and graduate schools.

Dr. Cha stated that governments are key to incentivising different sectors to work together to address the needs of society; however, competition within and between sectors is also an important driver. To illustrate the latter point about the benefits of competition, Drs. Koo and Cha made reference to two engineering professors at SNU who were both working on electric vehicles. The one’s work was funded by the state, the other funded by the private sector. The professors detested each other, never spoke or collaborated. Their professional competition has resulted in a number of ground-breaking discoveries. Hence, the key is to find the balance between convergence and competition to get the best results.

A member of the delegation then asked if Korea has any issues with youth unemployment. Dr. Koo responded that youth unemployment was deemed to be more of a selective issue in that graduates preferred working for either the established Korean conglomerates (known as *chaebols*. For example, Samsung) or the civil service. The former was considered as affording higher social status, and the latter offered long-term protected employment. Employment within the civil service remained the most preferred choice of graduates with some studying up to five years for the civil service exam.

Discussions concluded with Dr. Koo stating that SNU would like to expand its relations with partner institutions in South Africa to further internationalise and globalise SNU and broaden the perspective and views of Korean students. Seoul National University currently accepts approximately 1 000 international students per year and sends approximately 500 Korean students to study abroad. Hence, SNU, believing that diversity is a key source of creativity, is looking for South African universities with who to form Memoranda of Understanding (MoU) that would advance student and knowledge exchange.

* + 1. **Korea Advanced Institute of Science and Technology**

The delegation, accompanied by Mr. Manzini, travelled to Dae-jeon City, approximately two hours from Seoul, for a tour of the Korea Advanced Institute of Science and Technology’s (KAIST) Vision Hall.

Established in 1971, KAIST is Korea’s most elite, STI-focussed, research university and was established to produce the high-level STI human capacity needed to support Korea’s industrialisation drive and to conduct both the short- and long-term basic and applied research that enabled Korea’s strategic technological advancement.

Currently, Thomson Reuters ranks KAIST as Asia’s most innovative university and 6th in the world. Only the most intellectually gifted students from science and technology high schools are admitted to KAIST, most entering the graduate schools after only their first or second year of high school. Hence, most of KAIST’s students attain their PhD degrees in their early twenties. KAIST graduates are highly regarded globally and occupy top positions in industry and government.

The KAIST Vision Hall comprises the following four zones:

* Intro Zone – comprises the KAIST Eye and the KAISTian Wall. The Eye is a kinetic sculpture symbolising the eye of a scientist who observes a phenomenon, looks at the world creatively, and looks far ahead into the future. The sculpture consists of 71 pieces signifying the year (1971) of KAIST’s establishment. The Wall shows all the individuals who have realised the objectives of KAIST and include founders, presidents, faculty members, alumni and donors. The Chairperson of the delegation was invited to become a “KAISTian” by sharing a personal message that would be displayed along with her photo on the media wall.
* History Zone – comprises KAIST’s Development History and the Campus of Innovation. The history of KAIST is shown through a variety of media, such as historical documents, photos and videos. A significant fact on display in this Zone that attests to Korea’s commitment to advancement through STI, is that in 1970 Korea had no formal highways and yet by 1978 Korea had built the first industrial robot. The Campus of Innovation introduces college life at KAIST, specifically showcasing KAIST’s unique system and research-oriented education, known as Education 3.0, which seeks to maximise the potential and creativity of students through distinctive and rigorous academic programmes that encourage students to think creatively across a range of disciplines, and motivates them to be responsible global citizens in this hyper-connected society.
* Innovation Zone – introduces the research results of KAIST in various STI fields. KAIST’s research has over the past fifty years led to numerous technological breakthroughs and been at the forefront of cutting-edge innovation. Currently, KAIST has 143 research institutes and centres covering a vast array of STI disciplines.
* Vision Zone – comprises a theatre room which shows how KAIST has realised and exceeded the objectives set in the Terman Report written when it was established. The current and future objectives of KAIST is also displayed and comprised in its Vision 2031 Report.

Throughout the tour, the delegation noted the emphasis on human values, ethical development, creativity, care for others and the environment, and the value of challenge as the drivers behind the use and implementation of STI.

* 1. **Tuesday, 19 June 2018**
     1. **National Research Foundation of Korea**

The delegation, accompanied by Mr. Manzini, proceeded to a meeting at the National Research Foundation of Korea (NRF). The delegation met with Dr. Jong-Deok Kim (Director: Office of Global Programmes), Ms. Hyesoo Kim (Head: Asian and African Affairs) and Ms. Jihye Shin (Researcher: Asian and African Affairs).

Dr. Kim delivered a presentation that profiled Korea’s STI status, provided an overview of the NRF, summarised two programmes that facilitates industry / university collaboration and assists universities to translate their research into products and/or services, respectively, and documented the key STI research programmes between South Africa and Korea.

Key details from the presentation include:

* Korea’s STI system is co-ordinated and managed by the National Science and Technology Council (NSTC), with input from the Presidential Advisory Council on Science and Technology. Both these structures are located within the Presidency, with the Prime Minister heading the NSTC. The NSTC is responsible for the:
  + Co-ordination of major policies and a plan for science and technology promotion;
  + Establishment of a Basic Science and Technology Plan;
  + Distribution and co-ordination of the national R&D budget;
  + Investigation, analysis and evaluation of national R&D programmes; and,
  + Co-ordination of policy for science and technology human resources development.
* The NRF is one of three funding agencies of Korea’s Ministry of Science, ICT and Future Planning (much like South Africa’s NRF is the funding agency for the Department of Science and Technology).
* Korea’s total 2018 R&D budget is US$71 billion, making its total R&D investment as a percentage of its Gross Domestic Product (GDP) the highest in the world at 4.23%. South Africa’s R&D investment in relation to its GDP is 0.8%. The three areas of largest investment are fundamental science, life science, and information and communications technology (ICT). Furthermore, the private sector R&D investment comprises 72.7% of the total R&D budget.
* Key changes in Korea’s STI policy include transitioning from focussing on the number of investments to the quality (impact) of those investments; securing short-term finance needed for areas of strength and where development timelines are short, such as technology application development; fostering greater co-operation among innovation actors; being prepared for the FIR; and changing the national STI policy from focussing on “catching up to the developed world” to being “the new global pace setter”.
* The NRF’s 2018 budget of US$4.8 billion funds approximately 25% of the government’s total R&D investment and approximately 75% of the Ministry of Science, ICT and Future Planning’s R&D investment.
* The NRF’s four strategic goals include building a creative and competitive research environment; advancing its research support and management system; disseminating research outcomes and knowledge to society; and enhancing the NRF’s management efficiency.
* Currently, each Ministry receives funding for R&D and has approximately three funding agencies. In an effort to streamline operations and reduce duplication, the Korean government wants each Ministry to have one funding agency. Hence, the NRF has to consider and implement this directive and merge its operations and functions with the other two funding agencies of the Ministry of Science, ICT and Future Planning, while it also seeks to introduce new funding mechanisms for newly graduated researchers and researcher-designed and driven research focus areas.
* The Leaders in Industry-University Co-operation (LINC) Programme promotes the mutual growth of local universities and industries by encouraging the technological innovation of small and medium enterprises (SMEs) and by developing the specific skills needed by industry. The LINC programme, which provides tailor-made curriculums for local companies, permits these companies to be part of the selection process of students and course material and also has company staff teaching at the university, has recorded significant success since its establishment in 2012. The NRF is currently looking to expand this programme so that participating universities establish a formal Department for Industrial Demand.
* The Beyond Research and Innovation Development for Good Enterprise (BRIDGE) Programme assists universities to commercialise discoveries emanating from R&D activities. Hence, it helps the universities to develop skills in technology commercialisation; design intellectual property (IP) portfolios and business models; and provides small grants for translational research. Since, its establishment in 2015, the BRIDGE Programme has in two years, met and/or exceeded all its performance targets, which include developing 380 (target 199) new prototypes, establishing 97 (target 65) start-up companies within the participating universities, and granting 573 (target 179) new IP licencing agreements.
* The key achievements of the Industry-University Co-operation programmes are that in the 15 years since 2003, university Technology Holding Companies have increased from three to 36; university patent filings have increased from 1 182 to 18 864; university royalty income has increased from KRW1.9 billion to KRW57.6 billion; and the royalty income return rate has increased from 0.1% to 1.2%.
* The Joint Committee Meeting on Science and Technology between Korea and South Africa have met six times from 2005 to 2017. To date, there have been 19 joint research projects, each with a funding allocation of approximately US$1.5 million. These research projects have been the fields of nanotechnology, biotechnology, nuclear science, energy, astronomy and information technology (IT).
* Korea wishes to expand the co-operation programme with South Africa; however, this would be based on South Africa’s ability to match the funding investment of Korea. The new joint research programmes are expected to start later in 2018.

Discussions after the presentation centred on expanding the STI co-operation programme between the two countries and further exploring the successes of the NRF’s Industry-University Co-operation programmes. In relation to the latter, specific mention was made of the tax incentives granted to companies that actively collaborate with local universities and employ local university graduates.

* + 1. **Lunch meeting with Mr. Sang-Jin Shin, Chairman of the Standing Committee on Science, ICT, Broadcasting and Communications in the Korean National Assembly**

Elections had taken place shortly before the delegation arrived in Korea and its new Parliamentary Committees had not yet been constituted. Hence, Mr. Shin represented the Standing Committee on Science, ICT, Broadcasting and Communications as its outgoing Chairman.

Once introductions were made, the discussion focussed on the mandates of the two committees and a brief overview of the Korean National Assembly and how its membership was constituted. The committees had similar roles; however, a key difference was that the Standing Committee reviewed the qualifications and ethical standing of a potential Ministerial appointment, where it could offer recommendations as to an alternative appointment or endorse the appointment. The Committee; however, cannot prevent the appointment of a Minister. Furthermore, the Korean Parliament only has one house, the National Assembly, which consists of 300 members; of which 254 are appointed by their constituencies and 46 are appointed according to the proportional representation of political parties. Women only constitute 15% of the 300 National Assembly members.

A key point relating to STI is that 5% of Korea’s national budget is allocated to R&D, compared to South Africa’s approximate 0.9%.

* + 1. **Samsung Innovation Museum**

The delegation, accompanied by Mr. Manzini, travelled to Suwon City approximately one hour from Seoul, for a tour of the Samsung Innovation Museum (SIM) within Samsung Digital City (Samsung’s Corporate and Research Campus).

The delegation was first shown a short video documenting the origins of Samsung, its challenges and how its *New Management Initiative* of the 1990s transformed Samsung into the global conglomerate that it is today.

Thereafter, the delegation toured the SIM, which is dedicated to showcasing the past (Age of Inventors), present (Age of Industry Innovation) and future (Age of Creation) of the electronics industry, with each period represented by its own exhibition hall. Each exhibition hall showcases the unique inventions of that period, has information about the inventions and products on display, and interactive media walls and videos that provide additional information and context.

The delegation was shown a video that displays how Samsung envisages the technology of the future and the impact that this will have on people’s lives. The delegation also toured a display kitchen incorporating Samsung’s appliances and how these appliances, with the help of sensors, cameras and by being connected to the internet, can be controlled from a smartphone from any location, keep track of food used and needed, and incorporate screens from which to access online content, among many other functions.

* 1. **Wednesday, 20 June 2018**

The delegation travelled to Incheon International Airport where they boarded a flight to Narita International Airport, Tokyo, Japan.

1. **JAPAN**

The delegation was met at the airport by Ms. René Everson-Varney, Counsellor: Political, from the South African Embassy in Tokyo. The delegation stayed at the Imperial Hotel in Tokyo for the duration of their visit. The programme comprised of the following activities:

* 1. **Wednesday, 20 June 2018**
     1. **South African Embassy, Tokyo**

The delegation was accompanied by Ms. Everson-Varney to the Embassy, where they were met by Ambassador Thulani Dlomo, Ms. Eudy Mabuza (Minister Counsellor: Science and Technology), Ms. Betty Maharaj (First Secretary: Political), and Mr. Daisuke Tanaka (Liaison Officer: Science and Technology). Once introductions were made, Ambassador Dlomo welcomed the delegation to Tokyo and gave a brief overview of the relationship between South Africa and Japan. This introduction was followed by a comprehensive brief by Ms. Mabuza on the engagements the Embassy had secured for the delegation during its visit to Tokyo.

The following key issues were raised during the introductory and programme briefings:

* The Ambassador requested that the delegation, during its engagements, consider two significant factors. The first being that Japan is a world leader in research on and technology development in renewable energy and how this can be used to mitigate the effects of climate change; and how the delegation could assist South Africa’s efforts to secure R100 billion in Foreign Direct Investment (FDI). Regarding the latter, since 2013, the Tokyo International Conference of Africa’s Development (TICAD) has shifted its focus from development assistance to include FDI. Hence, the Japanese private sector is being encouraged to look for investment opportunities within Africa. This offers South Africa a crucial platform to promote and advocate for the incorporation of STI discussions within the FDI agenda of TICAD.
* Japan and South Africa have a long-standing, well-established STI co-operation programme, which Japan is keen to expand. However, issues stemming from bureaucracy, IP ownership modalities within joint projects, and the dearth of high-level skills in South Africa, are all hampering efforts to realise greater degrees of collaboration between the two countries.
* Japan is the only country in the world with a Master Plan for the realisation of a “Hydrogen Economy”. South Africa, being endowed with extensive platinum reserves, which is used as a catalyst in hydrogen fuel cells, is looking to develop its own strategic advantage within the development and application of hydrogen fuel cells. Japan, being the world-leader in catalysis research, but lacking the platinum reserves and solar energy for the production of hydrogen is; therefore, an important partner for South Africa in terms of advancing the country’s ambitions of being part of the hydrogen economy. Hence, the Embassy highlighted the importance of the upcoming *Hydrogen Energy Ministerial Meeting*, which will be held on 23 October 2018 in Tokyo. The *Hydrogen Energy Ministerial Meeting* is deemed to be of great strategic significance for South Africa’s “hydrogen economy” objectives. The Embassy also informed the delegation about the Science and Technology in Society Forum that will be held in Kyoto from 7 – 9 October 2018.

The Chairperson expressed her appreciation to the Ambassador and Embassy Officials for the comprehensive briefing and gave her assurance that the delegation would consider all the proposals made.

* 1. **Thursday, 21 June 2018**
     1. **The National Diet of Japan**

The delegation, accompanied by Ambassador Dlomo, Ms. Mabuza, Ms. Everson-Varney and Mr. Tanaka, proceeded to a meeting at the National Diet, Japan’s bicameral legislature, which comprises the House of Representatives (lower house) and the House of Councillors (upper house). Here the delegation met with the Special Committee on Promotion of Science, Technology and Innovation, which was led by Hon. Shinichiro Furumoto.

Hon. Furumoto welcomed the delegation and introduced the committee members. He then made a statement regarding the good relations and positive trade associations between the two countries. The Special Committee is responsible for overseeing all matters related to STI, specifically ensuring that the Five-year Basic Science and Technology Plan promulgated by the STI Office in Cabinet is implemented.

The Chairperson then introduced the delegation and provided an overview of the purpose for the visit to Japan, also expressing the wish that co-operation between the two countries be expanded. Questions posed by the delegation focussed on how the Special Committee fulfils its oversight role and how Japan promotes skills development and the development of SMEs.

Various members of the Special Committee responded by stating that they follow the objectives of the Basic Science and Technology Plan to ensure that they fulfil their oversight functions. Japan is actively promoting skills development, and is specifically trying to increase the number of women enrolling for STI degrees and pursuing STI careers since this is key to alleviating poverty. Japan is also promoting entrepreneurship and the development of SMEs through a vast array of initiatives.

The meeting concluded with all parties expressing appreciation for the constructive discussion.

* + 1. **Japan – African Union Parliamentary Friendship League**

The delegation then proceeded to a meeting with the Japan – African Union Parliamentary Friendship League at the Offices of the Members of the House of Representatives within the Diet Precinct and was hosted by the League’s President, Hon. Ichiro Aisawa.

After introductions, Hon. Aisawa made mention of the economic relations between the two countries, which would hopefully be extended at the TICAD meeting scheduled for 2019. Hon. Aisawa further stated that Japan, being a small country with no significant natural resources, used creativity and STI to advance its economic development. It; therefore, could assist countries wanting to do the same. South Africa, due to its mineral wealth, had a significant advantage to exploit and should ensure that it negotiated trade agreements for mutual benefit.

The Chairperson acknowledged that Japan’s rapid advancement through the use of STI was what had induced the delegation’s visit. The Chairperson also expressed the wish that economic relations would be extended at the 2019 TICAD meeting and also requested that the League consider incorporating a STI Policy Dialogue in the meeting agenda, since STI is crucial for development and would enhance investment opportunities between Africa and Japan.

The Deputy-President of the League, Hon. Asahiko Mihara, noted that Japan was keen to invest in South Africa; however, what was of concern was the uncertainty around the education level of South Africa’s workforce. He went on to say that Japan’s (and Korea’s) rapid economic development was realised because these countries had a highly educated population with a very strong work ethic. He also stated that education was the sole responsibility of the country looking to develop itself. Japan, currently has 0% unemployment; hence, it too needs skilled workers, especially foreigners.

The discussions concluded with all participants expressing their appreciation for the engagement.

* + 1. **New Energy and Industrial Technology Development Organisation**

The delegation, accompanied by Ms. Mabuza, Ms. Everson-Varney and Mr. Tanaka, proceeded to a meeting at the New Energy and Industrial Technology Development Organisation (NEDO), where the delegation was briefed on the REMIX Water Project in eThekwini Municipality, Durban, which is a joint research project under the ambit of the South Africa – Japan bilateral STI co-operation agreement. The project is funded by Japan’s Ministry of Economy, Trade and Industry, which has entrusted it to NEDO, an agency of this Ministry and Japan’s largest R&D management organisation. The main objective is to demonstrate the effectiveness of Japan’s clean energy and environmental technologies. The REMIX Water Project, implemented by HITACHI on behalf of NEDO, comprises the building of a desalination plant that combines sea water with treated sewage water to reduce, by up to 40%, the energy used by desalination plants to filter out the salt from the water and reduce the salt level of the brine that is discharged back into the environment.

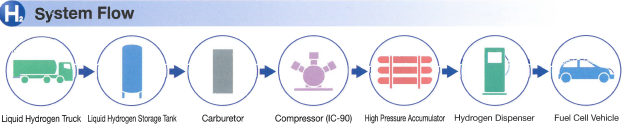
The project started in 2016 and will end in 2020. However, current work is being hindered since the project is waiting for the Department of Environmental Affairs to finish an appeal relating to the Environment Impact Assessment (approximately three months so far), and the Department of Water and Sanitation not yet having issued the project with a water licence (application submitted more than two months ago).

The water produced by this demonstration desalination plant will be tested and HITACHI will recommend to the eThekwini Municipality what it can be used for. Once the technology has been proven, HITACHI will commercialise it and may consider a joint venture with a South African partner to sell the technology to other municipalities. There are also ongoing discussions with South Africa’s Department of Science and Technology for the establishment of a Water Technologies Research Institute and the possible funding of a Research Chair in Water Technologies.

The delegation expressed their appreciation for this presentation, undertaking to assist with the delays being experienced by the project.

* + 1. **Iwatani Hydrogen Filling Station**

The delegation then proceeded to a site visit at the Iwatani Hydrogen Refuelling Station in ShibaKoen. Iwatani is Japan’s first hydrogen station, which also features a Fuel Cell Vehicle (FCV) showroom. The system flow of the refuelling station is represented by the following diagram, where the ionic compressor has been supplied by the German company, Linde. The ionic compressor forms the heart of the refuelling station and supports the latest technologies to achieve quick refuelling (5 kg hydrogen / 3 minutes).



Source: Iwatani Information Brochure (<http://www.iwatani.co.jp/>)

After touring the refuelling station, during which the operation was explained and demonstrated, the delegation was shown Toyota’s FCV, the Mirai, and also taken for a test drive in the car.

While at the refuelling station, the delegation also observed how other makes of hydrogen FCVs were refuelled. The Mirai currently retails for approximately R700 000 and is sold in the United States of America and certain European states that have the infrastructure to service and fuel these cars.

* 1. **Friday, 22 June 2018**
     1. **Japan Science and Technology Agency**

The delegation, accompanied by Ms. Mabuza and Mr. Tanaka, proceeded to a meeting with officials from the Japan Science and Technology Agency (JST). The meeting was held at the Miraikan, JST’s National Museum of Emerging Science and Innovation.

The JST was represented by Mr. Osamu Kobayashi (Director: Department of International Affairs) and Mr. Shoichiro Katayama (Executive Director: Miraikan).

Mr. Kobayashi provided an overview of JST, Japan’s premier national R&D agency, which is ranked fourth in the world by Reuters in its 2017 Top 25 Global Innovators (Public STI Institutions). JST’s key functions are to:

* Formulate forward-thinking R&D strategies;
* Create knowledge through the promotion and funding of innovative R&D;
* Use knowledge to address economic and social issues;
* Promote international R&D collaboration;
* Develop STI human resources; and
* Promote dialogue with society around STI.

Mr. Kobayashi stated that JST was trying to initiate a new call for joint R&D projects with South Africa, which would hopefully start in 2019. Currently, under the Science and Technology Research Partnership for Sustainable Development (SATREPS), which addresses global development challenges, there are two projects being implemented by the Department of Science and Technology. The first project is the *Establishment of an Infectious Disease Early Warning System for Southern Africa incorporating Climate Predictions*, which is a five-year (2014 - 2019) project that aims to develop a climate-based early-warning system for improved management of infectious diseases in the Limpopo area. The second project is *The Production of Biofuels using Algal Biomass*, which is a five-year (2016 – 2021) project that aims to develop a cost effective process for the production of biofuels from microalgae towards the development of a renewable energy industry.

The visit to Miraikan (Mirai means Future, and Kan means House) was to showcase JST’s premier science communication initiative. JST’s Science Communication objective is entrenched within Japan’s national science plan and has its own allocation within the national budget. Japan views science communication as very important since it is taxpayers’ money that funds the national STI objectives. Hence, the public understanding the value of STI is crucial to secure their support and co-operation in “co-creating the future” through STI.

Discussions focussed on whether Japan had designated science communication courses at university, and in the JST’s experience, what model of national STI co-ordination worked best. The latter being placed within the context of having a stand-alone ministry for science that would solely be responsible for co-ordinating the system, or having a Cabinet-level co-ordinating council that would then ensure that all ministries that have R&D mandates fulfil the objectives of the national science plan.

With regard to science communication courses, Japanese universities offer dedicated undergraduate and postgraduate degrees, and all science museums offer science communication courses. The Miraikan specifically employs graduates with a minimum of a Master’s degree and offers them further training through a five-year science communication course. With regard to co-ordinating STI, Japan has the Council for Science, Technology and Innovation (CSTI) as a Cabinet Office under the leadership of the Prime Minister and a Minister of State for Science and Technology Policy. The CSTI oversees and co-ordinates all of Japan’s S&T activities and ensures that the ministries that have R&D mandates, implement these according to the national S&T plan. Japan still grapples with whether a big co-ordinating council and small ministries offer the most efficient and effective system, or vice versa. However, what is not questioned, is having STI co-ordinated at the level of the Presidency / Prime Minister.

The delegation then toured the Miraikan where they interacted with the displays and exhibits that are used to demonstrate the value of STI and fundamental S&T principles. The delegation also got to meet the Miraikan’s most famous “citizen”, ASIMO, the robot. ASIMO demonstrates amazing movements and provides insight into how humans and robots will interact in the future. During the tour, the Chairperson was offered the opportunity to control the movements and speech of an android, and via the android, to interact and communicate with the rest of the delegation.

The tour concluded with the delegation participating in an exhibit used to demonstrate scientific thinking and investigation.

* + 1. **Renewable Energy Exhibition**

The delegation, accompanied by Ms. Mabuza, and Mr. Tanaka, then travelled to Yokohama for a tour of the Renewable Energy Exhibition.

The Renewable Energy Exhibition was funded by Japan’s Cabinet Office and the Ministries of Education, Culture, Sports, Science and Technology; Economy, Trade and Industry; Environment; and Land, Infrastructure, Transport and Tourism. The visit to the Exhibition sought to provide the delegation with some insight into Japan’s R&D effort towards a Hydrogen Economy under the Cross-Ministerial Strategic Innovation Promotion Programme. South Africa and Japan have had three workshops on hydrogen to date, and are looking to establish further joint R&D projects for the next-generation of hydrogen related technologies.

During the tour, the delegation received brief presentations on R&D that focusses on energy carriers that will lead to the development of efficient and cost-effective technologies that use hydrogen, realising the objective of a low-carbon society. The energy carrier project presented was the *Development of a Carbon Dioxide Free Ammonia Value Chain* that seeks to produce hydrogen from fossil fuels and renewable energy (specifically solar), transport the hydrogen and ammonia produced in its various states (which would require the development of custom-made transportation), and then use it for power generation, in fuel cells, in ammonia direct combustion gas turbines and furnaces, etc. The potential for South Africa to participate in these projects is immense since we have the natural resources (specifically solar) required in abundance and Japan does not, as well as having a dedicated, well-established Hydrogen R&D Strategy. Hence, South Africa can become a key stakeholder in the production and transport of hydrogen, which in terms of importance and scope, could equal the current international Square Kilometre Array Radio Telescope project.

* 1. **Saturday, 23 June 2018**

The delegation, accompanied by Ms. Mabuza, Ms. Maharaj and Mr. Tanaka, visited Asakusa, the most historical and traditional town in Tokyo. Thereafter, the delegation observed how South African Universities are marketed to Japanese students at the *Japan Student Services Organisation’s (JASSO) 2018 Study Abroad Fair*, where the Embassy had an exhibition stand. The delegation then visited Akihabara, Japan’s largest electrical and electronics centre.

* 1. **Sunday, 24 June 2018**

The delegation, accompanied by Ms. Everson-Varney, travelled to Narita International Airport for the flight back to South Africa.

1. **DELEGATION OBSERVATIONS**

* Throughout the study tour, the delegation noted the emphasis on human values, ethical development, creativity, care for others and the environment, and the value of challenge as the drivers behind the use and implementation of STI.
* Furthermore, the nurturing of creativity, in people and in organisations, is regarded as crucial to being innovative and is entrenched in all strategies and plans. For example, Korea’s economic plan is titled the *Creative Economy Plan* and seeks to create jobs and strengthen innovation by being creative (i.e., problem-solving, converging STI with culture and industry), and build a society where creativity is respected and embedded in the national psyche. Japan, in its science communication exhibits, characterises scientific investigation as the application of creative thinking.
* All the organisations visited by the delegation expressed a strong desire to further expand the collaboration efforts already in existence between the two countries. This extends to student training and exchange.
* Both Korea and Japan, at the time of their reconfiguring their economies through STI, had in place, an already highly-skilled workforce; created by the importance that their cultures place on education. South Africa, has the added challenge of creating a highly-skilled workforce while it stays abreast of, and develops its own strategic areas of expertise, within the global technology development sphere.
* Both Korea and Japan have STI policy formulation and the co-ordination of their science and innovation systems located within cabinet offices under the President and lead by the Prime Minister. This configuration ensures that all ministries that receive a budget allocation for R&D, implements their R&D mandates as dictated by the national STI plan.
* The delegation wishes to support the Joint Commission of Co-operation between South Africa and Korea that will meet in South Africa for the first time later in 2018, since its formation in 2014. It is hoped that the discussions will be productive and promote the strategic advantage of both countries.
* The delegation noted the importance placed on science communication in ensuring that the public understood the role and value of STI. Japanese universities have formal undergraduate and postgraduate degree courses in science communication. Furthermore, science communication initiatives are imbedded in all levels of education, starting with early childhood development.

1. **RECOMMENDATIONS**

The delegation, having concluded their international study tour to the Republic of Korea and Japan, recommends that:

* The Departments of Science and Technology and Higher Education and Training assist Seoul National University to find partner institutions within South Africa with who a MoU for student and knowledge exchange can be entered into.
* The Minister of Science and Technology favourably consider the invitation of the Japanese Minister of Economy, Trade and Industry to participate in the *Hydrogen Energy Ministerial Meeting*, which will be held on 23 October 2018 in Tokyo, since it believes the *Hydrogen Energy Ministerial Meeting* will be of great strategic importance to realising South Africa’s “hydrogen economy” objectives.
* The Department of Science and Technology urgently engage with the Departments of Environmental Affairs and Water and Sanitation and the Kwa-Zulu Natal Provincial Government to speedily resolve the issues delaying progress with the REMIX Water Project in the eThekwini Municipality.
* The Department of Science and Technology consider, prior to the commencement of future joint research and development projects, negotiating implementation protocols with all relevant stakeholders and affected parties that will ensure that projects are not unnecessarily delayed by bureaucratic processes.
* The Committee in previous recommendations emphasised that Government consider the level at which science, technology and innovation policy is formulated and how South Africa’s National System of Innovation should be co-ordinated and managed to meet the objectives of the National Development Plan.
* The Department of Science and Technology increase its efforts regarding showcasing South Africa’s science, technology and innovation skills and competencies to alleviate the concerns of those wishing to invest in the country.
* The Department of Science and Technology explore the feasibility of establishing a Water Technologies Research Institute and a Research Chair in Water Technologies.
* The Departments of Science and Technology and Higher Education and Training consider the development of a formal degree in science communication.
* The Departments of Science and Technology and Social Development consider the establishment of a programme that introduces the concepts and principles of science and technology at the early learning stages.
* The Department of Science and Technology consider the strategic benefit of participating in Japan’s Development of a Carbon Dioxide Free Ammonia Value Chain energy carrier project to enhance South Africa’s Hydrogen research and development programme and for skills development.

**Report to be considered.**