SOUTH AFRICA-IRELAND RESEARCH CLUSTER PROGRAMME

CLOSE-OUT REPORT AND PROJECT EVALUATION- OCTOBER 2022

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Background and Introduction:

In October 2019, the Technological Higher Education Network South Africa (THENSA) and THEA hosted a research colloquium involving 9 member institutions of THENSA and 5 Irish Higher Education institutions from the THEA consortium. A total of 80 academics participated in the colloquium. The purpose of the colloquium was to identify the potential and strategic research areas of mutual interest within the technology sector. The overall aim of the programme that the colloquium gave rise to was to **strengthen existing research competence and build new research competence by facilitating research co-operation and partnerships between South African and Irish Universities/Institutes of Technology.**

The following thematic areas were mutually agreed upon:

THEMATIC RESEARCH AREAS	LEAD INSTITUTIONS	CO-LEADERS OF CLUSTERS
1. ENGINEERING(BIOMEDICAL ENGINEERING, ROBOTICS AND ADVANCED MANUFACTURING	CENTRAL UNIVERSITY OF TECHNOLOGY (CUT) MUNSTER UNIVERSITY OF TECHNOLOGY (MTU – *previously CIT*)	PROF. DEON DE BEER PROF GER KELLY
2. SPACE SCIENCE, INNOVATION HUBS AND ICT	CAPE PENINSULA UNIVERSITY OF TECHNOLOGY (CPUT) MUNSTER UNIVERSITY OF TECHNOLOGY (MTU – *previously CIT*) (BLACKROCK OBSERVATORY)	PROF ROBERT VAN ZYL *(HAS SINCE LEFT THE INSTITUTION)* DR NIALL SMITH
3. WIL, INDUSTRY PARTNERSHIPS AND APPRENTICESHIPS UP TO PHD	CAPE PENINSULA UNIVERSITY OF TECHNOLOGY (CPUT) CENTRAL UNIVERSITY OF TECHNOLOGY (CUT) WATERFORD INSTITUTE OF TECHNOLOGY	PROF CHRISTINE WINBERG DR HENRI JACOBS DR FRANCES FINN

4. WASTE MANAGEMENT AND THE CIRCULAR ECONOMY	CAPE PENINSULA UNIVERSITY OF TECHNOLOGY (CPUT) MANGOSUTHU UNIVERSITY OF TECHNOLOGY (MUT) CENTRAL UNIVERSITY OF TECHNOLOGY (CUT) TECHNOLOGICAL UNIVERSITY OF THE SHANNON MIDLANDS MIDWEST (TUS) *(PREVIOUSLY LIMERICK INSTITUTE OF TECHNOLOGY)*	DR PAMELA WELZ DR GEORGINA D. ARTHUR PROF RYK LUES DR PATRICK MURRAY
5. AGRICULTURE AND FOOD SECURITY	TECHNOLOGICAL UNIVERSITY DUBLIN (TU-DUBLIN) TSHWANE UNIVERSITY OF TECHNOLOGY (TUT) INSTITUTE OF NATURAL RESOURCES (INR)	DR CATHERINE BARRY RYAN PROF TSHIMANGADZO LUCKY NEDAMBALE MS SILUNGILE DLAMINI
6. CURRICULA FOR THE 4IR	SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA) TSHWANE UNIVERSITY OF TECHNOLOGY (TUT) TECHNOLOGICAL UNIVERSITY DUBLIN (TU-DUBLIN)	DR JULIE REDDY PROF MAMMO MUCHIE PROF BRIAN BOWE

7. COVID 19 AND PRIORITY SETTING	TECHNOLOGICAL HIGHER EDUCATION NETWORK SOUTH AFRICA (THENSA)	DR ANSHU PADAYACHEE
	UNIVERSITY OF THE WITWATERSRAND (WITS)	PROF WILLIAM GUMEDE
	INSTITUTE OF NATURAL RESOURCES (INR)	DR SERSHEN NAIDOO
	UNIVERSITY OF KWAZULU-NATAL (UKZN)	PROF URMILLA BOB
	AFRICAN CENTRE FOR THE CONSTRUCTIVE RESOLUTION OF DISPUTES	VASU GOUNDEN
	CENTRAL UNIVERSITY OF TECHNOLOGY (CUT)	PROF DEON DE BEER
	UNIVERSITY OF PRETORIA (UP)	PROF TINYIKO MALULEKE
	CENTRAL UNIVERSITY OF TECHNOLOGY (CUT)	PROF RYK LUES
	THORNTREE COACHING, FACILITATION AND MENTORING	PROF AHMED WADEE
	UNIVERSITY OF THE WITWATERSRAND (WITS)	PROF AMES DHAI
	UNIVERSITY OF KWAZULU-NATAL	DR NTOKOZO NZIMANDE

	CENTRAL UNIVERSITY OF TECHNOLOGY (CUT) UN HIGH COMMISSIONER FOR HUMAN RIGHTS	PROF LUCIA ANELICH JUDGE NAVI PILLAY
8. TOURISM	TECHNOLOGICAL HIGHER EDUCATION NETWORK SOUTH AFRICA (THENSA) UNIVERSITY OF KWAZULU-NATAL DEPARTMENT OF TOURISM ATLANTIC TECHNOLOGICAL UNIVERSITY *(previously Galway-Mayo Institute of Technology)*	Dr Anshu Padayachee PROF URMILLA BOB DR KHOLADI TLABELA MR SIPHO NGOMANE MS CAIT NOONE MS JACINTA DALTON

The participants stressed the fact that curriculum development for the 4IR should be a cross cutting initiative in the areas identified for collaboration and highlighted the fact that improving linkages with industry was key to technology and human capacity development.

The specific recommendations emerging from the colloquium included the following:

- Establish institutional hubs (based on existing infrastructure and capacity) that will host the six research clusters and be responsible for facilitating the research projects that emerge within each thematic area (see Clusters 1-6 in Table 1).

- Submit the research proposals developed by the six research clusters to the NRF for co-funding and request that participating institutions allocate funds from their UCDP/DHET/research development grants to support researchers from their respective institutions to participate in these collaborative projects.
- Source additional funding for travel grants for approximately 3 persons from each research cluster to attend the follow-up colloquium to be held in Ireland.
- Submit a proposal to the Irish embassy for travel grants for South African participants to attend the follow up colloquium.
- Source local and international funding (mobility and research) for students (MSc and PhD) that will be associated with projects run by the research clusters**.**

Funding received from the Irish Embassy in 2019 and 2020 allowed the members of the partnership to action the above recommendations to varying degrees across clusters over the last two years. What follows below is a summary of the achievements to date (as at 2 October 2022), and the ongoing activities and recommendations for the next phase of the funding to aim for self sustainability of the initiatives after 2023/4.

Overview of activities

The colloquium held in Durban (October 2019) served to create joint research clusters, five of which were established in 2020: Bio-medical engineering, robotics and advanced manufacturing; Space Science, Innovation Hubs and ICT; WIL and Curricula for the 4th Industrial Revolution; Waste Management and the Circular Economy; Agriculture and Food Security. Subsequent to their establishment, a South African and Irish co-leader was appointed for each cluster and mechanisms/systems for co-writing of grants, scientific papers, research project design, and monitoring and evaluation have been put in place.

THENSA then appointed a Programme Coordinator to provide the clusters with support in the form of organising opportunities for the cluster members to interact, identify grants that the clusters could target and assist with the production of research outputs, dissemination and linkages into other networks. All clusters were provided with platforms to meet and discuss collaborative research opportunities on multiple occasions during the programme's lifespan and with the support of the THENSA secretariat a number of the clusters submitted grants that attracted co-funding. Research outputs included, study visits, workshops, research articles and conference presentations and these are summarised in Table 1.

Mid-way through the programme the need to create two urgently needed research clusters emerged as interactions between Irish and South African partners revealed the need to engage and contribute to the developing policy relevant research on COVID-19 and

Tourism which was a sector that was hit hard by the pandemic. This led to the creation of two additional research clusters, one focussed on COVID-19 and a second on Tourism (see clusters 6 and 7 in Table 1).

A draft programme for follow-up colloquium, planned to take place in Ireland, was prepared but the colloquium could not be held due to the pandemic. Nevertheless, a funding proposal for Phase 2 was prepared and submitted to the Irish Embassy and funding received in 2020; this funding led to a series of collaborative research projects and despite the travel restrictions imposed by the pandemic, clusters were assisted with preparing NRF-KIC mobility grant applications to enable South African researchers to travel to Ireland for Phase 2 (Colloquium). Many of these visits have now taken place after the travel restrictions were lifted, while a handful are scheduled to take place within the next month. A challenge post COVID-19 and after the Lifting of travel restriction was acquiring permission for staff to travel to and from Ireland and South Africa. Universities needed staff on the ground to ensure that students were on track for examinations and catch-up teaching etc. before they could allow travel. This resulted in some programmes being delayed by at least 3 months.

When the travel restrictions were lifted a number of the Irish partners participated in THENSA's international research conference which allowed Irish and South African cluster members to network and take forward their projects on a face to face basis. Academics from a number of the Irish member institutions also participated in the panel discussions that were a feature of the conference which was held in Johannesburg, South Africa.

Importantly, the clusters appear to have become sustainable vehicles for collaborative research. Examples include:

- The food security and agriculture cluster has attracted co-funding to conduct a study on low cost biological treatment of dairy waste water;
- Members of the Space Science Cluster have just submitted a grant on the use of satellite imagery for seaweed farming;
- The Space Science Clusters initiated a project aimed at establishing a Space Academy in South Africa offering curricula that are co-developed and co-taught by South African and Irish academics and industry experts.

Outputs

All clusters have provided evidence of active engagement and have adapted some of the objectives/outputs that were originally designed for the cluster. Significant effort has been put into proposal/grant writing with 8 research proposals developed and 11 grant applications submitted. The number and impact of the programmes outputs has been impressive:

- 2 conference presentations

- 3 high level reports
- 6 research studies
- 2 journal articles
- 1 book chapter
- 8 successful co-funding grants
- 2 popular science articles

In addition to the above, there have been multiple TV and radio interviews based on the programme's research outputs**. A more detailed description of the outputs produced by each cluster is given in Table 1 below.**

TABLE 1: Summary of projects, outputs and co-funding achieved.

RESEARCH CLUSTER	RESEARCH PROJECT	INSTITUTIONS	OUTPUTS	CO-FUNDING
1. SPACE SCIENCE, INNOVATION HUBS AND ICT	**P1.** Development of Industry 4.0 technologies for deployment in space with a special focus on AI and Cybersecurity	• Cape Peninsula University of Technology • Munster Technological University • Institute of Natural Resources NPC • Mangosuthu University of Technology • South African Radio Astronomy Observatory • Tshwane University of Technology • Vaal University of Technology • Walter Sisulu University	**P1:** • Joint presentation at AfAS Session at the AERAP Virtual Conference: Data and Development Partnerships for Africa-EU in Astronomy. **P2**: • Feasibility study on use of drones for catchment management has been completed. *(Annexure 1a and 1b)*	Co-funded by CPUT, INR and Umgeni Water

	P2. The use of unmanned aerial vehicles in the management of catchments **P2.** A South African-Irish participatory approach to developing space science curricula: meeting the needs of the future and beyond	• South East Technological University	• A pilot study involving drone flights and water quality monitoring has been completed at 3 sites and a report has been produced. • Briefing meeting on project held between SA and Irish partners. • Partnership with Umgeni Water established. • The cluster is engaged in a project focussed on co-developing space science curricula for the sector, and ultimately establishing a Space Academy; this project brings together industry partners and UoTs from South Africa and Ireland. The partners have conducted a ned analysis with the assistance of Industry partners and will be visiting the International Space University on a study. This will be followed by a workshop to develop the curricula in South Africa which will involve Irish partners who have experience in this area. • Partnership with industry consortium, ZASpace established as an enabling mechanism.	
2. BIOMEDICAL ENGINEERING, ROBOTICS AND ADVANCED MANUFACTURING	**P1.** The use of Additive Manufacturing to support COVID-Related Rapid Response	• Cape Peninsula University of Technology • Central University of Technology • Munster technological University • Atlantic Technological University • Mangosuthu University of Technology • Technological University Dublin • Tshwane University of Technology • University of Zululand • Walter Sisulu University • South East Technological University	• SA and Irish partners developing project proposal on rapid prototyping response to COVID-19 manufacturing needs. *(Annexure 2)* • SA partners have received a number of excellent grants; these will be used to fund some of the collaborative work with Irish partners. • FITCH Medical Device report received and feasibility study for commercialization's under way – project shows start-up potential.	

			• CUT (Prof. Deon de Beer) completed a visit to various institutions in Ireland, with MTU as host. • Prof Ger Kelly (MTU) will visit South Africa and also attend the RAPDASA Annual International Conference in Somerset West as part of the planned visit.	

3.WIL INDUSTRY PARTNERSHIPS AND APPRENTICESHIPS AND CURRICULUM FOR THE 4IR	**P1.** Enhancing work-integrated learning through South-North collaboration: a comparative analysis	• Cape Peninsula University of Technology • Central University of Technology • Munster Technological University • South East Technological University	**P1:** • Journal article in press at International Journal of Work-Integrated Learning ("Enhancing work-integrated learning through South-North collaboration: a comparative analysis"). *(Winberg, C, Finn, F, Sheridan, I, Engil-Hills, P, Jacobs, H & Kent, E 2022, 'Enhancing work-integrated learning through South-North collaboration: A comparative contextual analysis. Journal of Work Integrated Learning (In-Press)', International Journal of Work Integrated Learning)* • Presentation regarding joint research article was given by representatives of the cluster, to Science Forum South Africa in December 2020. • Research grant for travel obtained, and SA cluster travelled to Ireland in June 2022. • One project proposal submitted for holding joint workshop.	

3. WIL, INDUSTRY PARTNERSHIPS AND APPRENTICESHIPS AND CURRICULUM FOR THE 4IR (*continued*)	**P2.** Strand 4 Irish Research Council Project (*IN PROGRESS*)	• Cape Peninsula University of Technology
		• Central University of Technology
		• University of Johannesburg
		• Munster Technological University
		• South East Technological University
		• Galway-Mayo Institute of Technology
			P2:
			• Travel grant secured
			• Current grant budget relates to travel to SA for partnership development/working
			• Will review the proposal and request a reallocation of funds for research hours and adapt to reflect COVID challenges/workings
			• Cluster currently designing survey instrument to reflect/capture resilience/WIL during pandemic
			• Cluster conceptualised and pitched proposal for establishment of WIL-SA
			• Six universities participated (three from each country) in a survey-based study which was conducted from mid-November 2021 to January 2022. The aims of the study were to:
			  • Further develop partnerships between Irish and South African Universities of Technology relative to the investigation and further development of Work Integrated Learning (WIL), Industry Partnerships and Apprenticeships.
			  • To strengthen new THENSA partnerships through collaboration and networking activities in Ireland and South Africa.
			  • To explore current WIL management models, practices and policy within Ireland and South Africa in order to fully understand the context and challenges associated with the implementation of WIL within Higher Education Institutes and Industry
			  • To co-develop new best practice guidelines, models and frameworks (including policy) for WIL and WIL Partnerships.
			  • Further related research activities and analysis of the data will be done in Cape Town from 14-20 January 2023,
				Co-funder: Irish Research Council – New Foundations 2019 Strand 4: Networking and Collaboration Grant

			inclusive of a writing workshop to start with the writing of articles emanating from this research phase.	

4. WASTE MANAGEMENT AND THE CIRCULAR ECONOMY	**P1.** Development of biobased plastics **P2.** Creation of a South Africa-Ireland biohydrogen capacity building program	• Cape Peninsula University of Technology • Central University of Technology • Durban University of Technology • Limerick Institute of Technology • Mangosuthu University of Technology • Tshwane University of Technology • University of KwaZulu-Natal • University of Zululand • Vaal University of Technology • Walter Sisulu University	**P1:** • 4 funding grants obtained: -South African National Research Foundation (2021-2023) -Water Joint Programming Initiative (2018-2020) -SA NRF Knowledge Fields Development grant (for workshop) -Council for Scientific and Industrial Research Waste RDI Roadmap grant (2021-2022) • 2 publications: -Science of The Total Environment *(Annexure 3)* -South African Journal of Science • 1 Book chapter on the circular economy has been accepted for publication and is currently in press. **P2**: • This project is ongoing and hopes to design courses/curricula to introduce hydrogen and fuel cell technology to students across the country, educating the scientists, engineers, and potential end users of tomorrow and to develop and train a workforce for the emerging hydrogen technology industry. • The SA team in partnership with the Irish partners will develop curriculum	Co-funded by NRF, Water Joint Programming Initiative and CSIR

			materials, and educational offerings at various levels.	
5. AGRICULTURE AND FOOD SECURITY	**P1.** A review of challenges and opportunities of agriculture and food security in the 4IR: A North-South perspective **P2.** Developing strategies for mitigating dairy wastewater impact	• Central University of Technology • Munster Technological University • Institute of Natural Resources NPC • Mangosuthu University of Technology • Technological University Dublin • Tshwane University of Technology • University of KwaZulu-Natal • University of Zululand • Walter Sisulu University • South East Technological University	**P1:** • One article submitted to a journal (Elsevier Global Food Security) for review. **P2:** • Feasibility study on the use of low cost biological solutions for treating dairy waste water has been conducted. *(Annexure 4)* • Study on low cost biological solutions for wastewater treatment conducted and project will now move into second phase with collaboration between INR and DUT; funding grant secured from MilkSA.	Co-funded by MilkSA
6. COVID 19 PANDEMIC	**P1.** Priority setting for interventions in pre- and post-pandemic: A South Africa-Ireland comparison	• African Centre for the Constructive Resolution of Disputes • Central University of Technology • Institute of Natural Resources NPC • South African Technology Network • Thorntree Coaching, Facilitation and Mentoring • UN High Commissioner for Human Rights • University of KwaZulu-Natal • University of Pretoria University of the Witwatersrand	**P1:** • One position paper produced by South African team *(Annexure 5)* • 3 × Radio interviews by South African team on local radio stations • 2 × Television interviews by South African team on local TV stations • 2 × articles published in newsletter of South African Medical Association (Prof Ames Dhai and Dr Anshu Padayachee) *(Annexure 6)*	

7. Tourism	**P1+P2. Environmental scan of university offerings in tourism and hospitality studies** **P3 THE INTERNATIONAL TOURISM EDUCATION, RESEARCH AND TRAINING FORUM PROJECT**	Commissioned study by THENSA with input from all universities offering tourism programmes in South Africa. Study commissioned by Department of Tourism on programmes offered within their department as well as industry programmes. a. Training Workshop held in Galway, Ireland May 2022 b Training workshop and development of new curricula in partnership with SAQA held in Durban South Africa on 10-12 October (as per proposal- see attached) and to discuss establishment of TEG in SA.	Studies completed and recommendations submitted to Irish Embassy and Department of Tourism for consideration *(Annexure 7)* *(Annexure 8)*	Co-funded by Thensa and Department of tourism, respectively **Co funded by Irish Embassy/ THENSA and Department of Tourism**

RECOMMENDATIONS

1. The following projects within the thematic areas have been recommended for ongoing support. As an outcome of the project evaluation of outputs and inputs from the previous research clusters and the joint partners, the following areas of research, innovation and commercialisation was identified as priority thematic areas to be addressed through the following strategic research clusters:
    a. WASTE MANAGEMENT AND THE CIRCULAR ECONOMY
    b. WIL, INDUSTRY PARTNERSHIPS AND APPRENTICESHIPS AND CURRICULUM FOR THE 4IR
    c. SCIENCE PARK AND BUSINESS UNIT RESEARCH CLUSTER *(NEWLY FORMED CLUSTER SINCE THE COLLOQUIUM)*
    d. TOURISM RESEARCH CLUSTER *(NEWLY FORMED CLUSTER SINCE THE COLLOQUIUM)*

2. The programme is funded for a further phase to build on the huge gains that have been made in terms of creating communities of practice around thematic research areas that are of mutual interest and benefit to both countries.
3. That the clusters seek additional funding from other agencies, namely Department of Science and Innovation, the NRF and CSIR in South Africa and the Erasmus + programmes in Europe. Discussions with the co leaders are in an advanced stage to support the current proposal especially with regard to Space Science, Science Parks, Tourism and the Circular Economy (Bio-hydrogen curriculum development project- Trinity College, DCU and NUI in Ireland have indicated their commitment to the curriculum development project).
4. THENSA/THEA is entrusted with developing the implementation plan for the programme and the conducting the associated monitoring and evaluation.
5. The funding model to be theme based, with researchers (partners) competing for funding based on their projects' relevance to and potential impact in terms of the programmes theory of change and objectives; the allocation of funding to specific projects should be overseen by THENSA with input from THEA.

ANNEXURES:

- Annexure 1a - Feasibility Study into the use of Unmanned Aerial Vehicles for Catchment Management in The Greater Umngeni Catchment, KwaZulu Natal (April 2021)
- Annexure 1b - UAV Feasibility - Feasibility Report (June 2021)
- Annexure 2 - Additive Manufacturing for Rapid Response COVID-Related PPE Products
- Annexure 3 - Microplastics in the environment Interactions with microbes and chemical contaminants
- Annexure 4 - Feasibility Analysis of Low-Cost Biological Wastewater Treatment Options For Dairy Farms And Dairy Processing Plants In South Africa
- Annexure 5 - SATN COVID-19 Position Paper
- Annexure 6 - SAMA Insider September 2020
- Annexure 7 - THENSA Tourism Curriculum and Research Audit Revised August 2022
- Annexure 8 - THENSA THEA Tourism Report Ireland 2022 - June 2022

FINANCIAL REPORT:

Preliminary Financial report was sent to the Embassy on Monday, 10 October 2022.