ENSURING THE EXPERTISE TO GROW SOUTH AFRICA

ECSA's response to the key national infrastructure initiatives

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ECSA

EXECUTIVE SUMMARY

The study investigates how the Engineering Council of South Africa (ECSA) can respond to national infrastructure initiatives. An extensive literature review was conducted to gain insight into how other professional bodies have responded to the subject. Furthermore, interviews via a focus group and questionnaires were used as a method of data collection from ECSA registered persons with key knowledge and experience in infrastructure and other stakeholders. A systematic literature review was conducted on selected institutions, mainly members of the International Engineering Alliance (IEA), to establish how ECSA could be an active participant in the development of the government's key national infrastructure plans and programmes.

The literature review highlighted that most of the activities performed by international engineering regulatory institutions are covered under ECSA's core functions of registration, accreditation, development of engineers and regulation of the profession. ECSA's participation in infrastructure initiatives will lead to appropriate, effective and sustainable, and stable technical and decision-making capacity. This will contribute to South Africa's transition from a historically closed minerals economy to one that is integrated both globally and in terms of regulation. It was evident from the study that engineering professionals should be given the chance or opportunity to participate in infrastructure initiatives to provide leadership and direction and use their knowledge and skills in the project life cycle. This will likely lead to attracting higher investment in infrastructure development projects for much needed economic growth.

The findings were used to provide the following main recommendations:

- ECSA should emulate other international regulatory bodies by being proactive, vocal and advocating on issues that impact the engineering profession.
- ECSA should consider partnering with the department of the Auditor-General to assist in auditing infrastructure projects.
- ECSA should collaborate with voluntary associations for infrastructure research projects.

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ABBREVIATIONS

ABET	Accreditation Board for Engineering and Technology
AEER	Association for Engineering Education of Russia
BCSC	Building and Construction Standards Committee
BEM	Board of Engineers Malaysia
CBE	Council for Built Environment
CCTT	Canadian Council of Technicians and Technologists
EA	Engineers Australia
EC	Engineers Canada
ECSA	Engineering Council of South Africa
ECUK	Engineering Council United Kingdom
EI	Engineers Ireland
ENZ	Engineering New Zealand
EPA	Engineering Profession Act
HKIE	Hong Kong Institute of Engineers
IEA	International Engineering Alliance
IES	The Institute of Engineers Singapore
IESL	Institution of Engineers Sri Lanka
ISA	Infrastructure South Africa
JABEE	Japan Accreditation Board for Engineers Education
NBAI	National Board of Accreditation India
NSPE	National Society of Professional Engineers
RAE	Royal Academy of Engineering
SAAE	South African Academy of Engineering
SAICE	South African Institute of Civil Engineers
SAIEE	South African Institute of Electrical Engineers
UK	United Kingdom

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VA Voluntary Association

1. INTRODUCTION

1.1 Background to the study

Infrastructure development is critical to attaining South Africa's long-term economic and social goals. In the context of a developing country seeking significant structural change, the public sector must lead this effort. Infrastructure delivery will be one of the most significant contributors to South Africa's transition from a historically closed minerals economy to one that is globally and regionally integrated, low carbon, inclusive and promoting of dynamism in the industries of the future [2].

Infrastructure delivery comes in the form of construction projects which provide buildings and infrastructure that the rest of the economy relies on. It benefits the construction industry and enables large-scale job creation, skills development and poverty relief. There is an upward trend in infrastructure investment in most developing and emerging economies to meet social needs and support more rapid economic growth. According to the Organisation for Economic Cooperation and Development, the total global infrastructure investment required by 2030 for transport, electricity generation, transmission and distribution, water and telecommunications will be USD 71 trillion [3]. In South Africa, the government aims to spend about 30% of its gross domestic product on infrastructure development by 2050 [2].

The success of such government infrastructure programmes requires the participation of competent role players. For any development project, the principal role players in delivery programmes are the client, delivery and stakeholder teams. The functions of the client team are to provide effective leadership and direction to the delivery team and meaningfully engage with internal and external stakeholders. The delivery team, which is usually the project managers, designers, specialist professional service providers, manufacturers, constructors and engineering practitioners from different disciplines, is involved to provide leadership, technical support and guidance on the execution of the programmes. Thus, the client team performs a "buying function" whereas the delivery team performs a "selling" or "supplying function." Thus, both of these teams are driven by different exchange objectives [4].

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Generally, professional bodies are dedicated to the advancement of knowledge and practice of the professions through developing, supporting, regulating and promoting professional standards for technical and ethical competence [5]. Professional bodies can further be described in terms of the benefits they bring to the projects. These are summarised under six broad headings: productivity, social mobility, governance, ethical standards, international networks, and policy formation. Therefore, for any project to be successful, professionals are vital and must be allowed to apply their technical skills and provide leadership participation in infrastructure initiatives.

Six essential pillars must always be in place and balanced if a society is to have sufficient and stable technical and decision-making capacity for infrastructure delivery to be appropriate, effective and sustainable [6]. The pillars are individual, institutional, technical, decision-making, finance/funding and resources/equipment/tools/supplies.

Statutory institutions such as ECSA should develop, establish, provide, monitor and enforce professional, technical and industry standards for infrastructure delivery to be appropriate. However, the involvement of engineering professionals at the decision-making level, for example being involved in politics, allows them to use their professional knowledge to attract and defend important engineering infrastructural development projects [7]. Thus, it is important that engineering professionals not only participate as the delivery team but also as the client team to provide effective leadership and direction to the delivery team and meaningfully engage with internal and external stakeholders. Therefore, the active involvement of engineering professionals in decision-making bodies such as Infrastructure South Africa should be prioritised in policy guidelines. This will ensure that the expertise and the knowledge and skills of professionals are used in the best way possible to benefit South Africans. Further, Buthelezi argues that only those who are qualified and possess the required competency and skills should be placed at the helm of the delivery team [8]. Such deployment will spearhead the conception, implementation and maintenance of infrastructure projects to ensure that service delivery through the provision of services is achieved.

Quite often, infrastructure projects in developing countries have been criticised for cost overrun, delay, substandard construction works, ineffectiveness and low efficiency [9]. This can be attributed, perhaps, to non-deployment or involvement of competent professionals in the planning

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stages of the project among other factors. Several factors determine the success and failure of any infrastructure project to achieve its performance objectives in terms of end-users' needs and societies' economic benefits, including the deployment of competent teams in addition to the procurement strategy [10].

It is therefore evident from the background study that ECSA must be an active participant in infrastructure initiatives because it is the custodian of the engineering profession in the country. This will likely contribute to South Africa's transition from a historically closed minerals economy to one that is integrated both globally and in terms of regulation. It will lead to appropriate, effective, sustainable and stable technical and decision-making capacity for infrastructure delivery. ECSA should continue to develop, establish, provide, monitor and enforce professional technical industry standards. Further, professionals should be given the chance or opportunity to participate in infrastructure initiatives to provide leadership and direction by using their knowledge and skills in the project life circle. They must provide leadership and technical support to ensure high standards of productivity and good governance. This will likely lead to attracting higher investment in an infrastructure development project for much-needed economic growth.

1.2 The rationale for the study

ECSA's core function is to regulate the engineering profession in terms of the Engineering Profession Act, 46 of 2000. These include registration of competent engineering practitioners and governance of their professional conduct. In addition, ECSA promotes an appropriate level of education and training for engineering practitioners. ECSA may also advise the Minister of Public Works or any other minister and the Council for Built Environment (CBE) on matters relating to the engineering profession. It is within this context that ECSA deemed it necessary to investigate how it could respond to key national infrastructure initiatives.

The success of any key national infrastructure plans and programmes by the government are dependent on several factors including the use of competent technical expertise such as engineers in the country and good project management. Engineering practitioners from different disciplines must be involved to provide leadership, technical support and guidance on the execution of the programmes. The project managers plan and oversee projects from initiation

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through to completion. It is therefore apparent that ECSA and other professional bodies must be involved in advising on infrastructure initiatives since it is within their mandate to safeguard the public and environment.

The delivery of key national infrastructure projects has gained much attention in developing economies [1]. Countries are adopting new strategies and frameworks to execute public-sector projects. In South Africa, unfortunately, the role played by professional bodies on infrastructure project development seems to be insignificant and is a much-neglected sphere.

According to [1], the term 'infrastructure' captures many of the essential physical systems that enable cities, communities and organisations to function. These systems include communication networks, transport systems, power infrastructure and sewer systems, among others. It includes the roads we drive on, the electricity lines that bring us power and the airports we fly from. Infrastructure includes but is not limited to:

1. **Transport infrastructure**
    - Road, rail, tunnels, and bridges
    - Ports, airports, waterways, and canals
2. **Energy infrastructure**
    - Power stations, wind farms, hydro-electric plants
    - Power grid, lines, and connections
3. **Communications infrastructure**
    - Telephone cables
    - Phone towers
4. **Water infrastructure**
    - Reservoirs and dams
    - Pumping stations and levees
5. **Social infrastructure**

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- Education, including schools, universities and other facilities
- Health, including medical centres, hospitals and emergency response
- Law and security, including police and prison systems

6. Waste infrastructure

- Waste removal facilities and services
- Disposal and resource recovery facilities

The benefits of well-developed, functioning and maintained infrastructures are many. They include cost savings through enhanced efficiencies, improved planning, and effective governance; long-term viability through enhanced resilience; reduced or avoided social and environmental impacts [1].

1.3 Purpose and aim of the report

The purpose of this report was to investigate how the ECSA could respond to national infrastructure initiatives. The definitive goal was to provide guidelines on how the professional body could be of assistance in developing infrastructure projects.

The aim of the research was therefore to explore the role professional bodies such as ECSA could have in public sector infrastructure development projects in South Africa.

1.4 Methodology

This research project followed a quantitative and qualitative methodology to investigate how ECSA could respond to key national infrastructure initiatives. The methodology adopted was a literature review, a focus group and structured questionnaires. The literature review informed the research giving a clearer picture of how ECSA could be involved in key national development projects.

A thorough review of the published literature, including journals, books, reports and the internet, was undertaken to establish how other professional bodies have responded on the subject.

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A focus group discussion with engineering practitioners was conducted to solicit their views on the topic, followed by submission of written responses. Structured online questionnaires were also developed and used to collect data from ECSA-registered persons with experience and knowledge of infrastructure. The online survey lasted a month. Finally, interviews and desktop research with international engineering regulatory organisations were conducted to generally understand their role in public sector infrastructure development projects in their respective countries.

2. INTERVIEWS AND LITERATURE REVIEW ON INTERNATIONAL ENGINEERING REGULATORY INSTITUTIONS

2.1 Introduction

This section presents the findings of the interviews and literature review on international engineering regulatory institutions and how they have responded to key national infrastructure initiatives in their countries. Interviews and literature searches were conducted on selected international engineering institutions, primarily members of the IEA under the Educational Accords:

- Washington Accord for Science-Based Engineering
- Sidney Accord for Technology-Based Engineering
- Dublin Accord for Technical programmes in the area of Technologies.

These included:

- Engineers Ireland (EI)
- Japan Accreditation Board for Engineers Education (JABEE)
- Board of Engineers Malaysia (BEM)
- National Board of Accreditation India (NBAI)
- Association for Engineering Education of Russia (AEER)
- Engineers Australia
- Engineering New Zealand
- Hong Kong Institute of Engineers (HKIE)

- Engineers Canada (EC)
- Canadian Council of Technicians and Technologists (CCTT)
- Association for Evaluation and Accreditation of Engineering Programs (MÜDEK)
- The Institute of Engineers Singapore (IES)
- Accreditation Board for Engineering and Technology (ABET)
- Engineering Council United Kingdom (ECUK)
- Institution of Engineers Sri Lanka (IESL).

2.2 Findings

2.2.1 Engineers Ireland

Interviews and literature searches were conducted on EI, which established that EI prides itself on being a strong, independent and national voice that influences public policy. The institution achieves this by advocating for the profession and its contribution to social, environmental and economic development. It shapes and advocates for the implementation of public policies on, for example, infrastructure investment, climate action and biodiversity among others. It provides advice to government in the form of commentary on policy issues before publication. From the literature available, it forces itself to be visible in all infrastructure development issues. One way of achieving this is by publishing infrastructure report cards. It also has up-to-date information on the number of engineers in the field. EI offers good examples that ECSA could emulate on how to respond to key national infrastructure initiatives by being visible [11].

2.2.2 Japan Accreditation Board for Engineers Education

Only desktop research was conducted on JABEE. The institution's operations are similar to those of ECSA. Its main function is to accredit professional education programmes implemented by higher education institutions, such as universities. The institution is geared towards developing the engineering society and industry through accreditation of educational programmes in engineering, agriculture and science departments in higher education institutions. It does not advise government or get involved in infrastructure initiatives. However, other institutions and companies, such as Japan Infrastructure Initiatives Co. Ltd, invest in infrastructure projects. Japan's government, together with World Bank, also has a programme for a partnership for quality

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infrastructure investment for Asia's future. They borrow lessons learned from infrastructure quality investment principles to boost resilience in infrastructure projects in developing countries. Perhaps ECSA could learn such lessons and advocate for them to be replicated in South Africa [12].

2.2.3 Board of Engineers Malaysia

Similar to JABEE, BEM does not get directly involved in infrastructure development projects. However, it makes itself visible in the Malaysian market by publishing information on a wide range of topics, including professional practice, government policies and guidelines, legal issues, safety and health at work, management, and other information such as the career and business opportunities necessary for continuous development of engineers and other professionals. Most documents deal with training engineers which is its core business. Its work is mostly on education and accrediting engineering programmes. BEM was established by the Registration of Engineers Act of 1967; it restricts and limits the board to registration, training and accreditation. No section of the Act enables BEM to advise government. ECSA already excellently executes most of the work and activities BEM carries out [13].

2.2.4 National Board of Accreditation India

NBAI's main objective is the assurance of quality and relevance to technical education, especially of the programmes in the professional and technical disciplines such as engineering and technology. This is achieved by accrediting programmes offered by technical institutions. This aspect is already being carried out by ECSA in terms of its mandate to accredit engineering programmes offered by South Africa's higher education institutions [14].

2.2.5 Association for Engineering Education of Russia

AEER's key purpose is improving engineering education and practice in all of its aspects related to educational, scientific and technological areas. The association considers engineering education as to be of national strategic interest as part of the country's transition to sustainable development. Engineers are considered key actors in the socio-economic sphere of society. The association does not, however, get involved in national infrastructure projects, although its engineers have published information on state policy, which encompasses infrastructure

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development, with published documents on transport, sustainability, legal issues, etc. The association's objectives are confined to developing and improving engineering education and the profession. Infrastructure initiatives are mostly research on best practices. Its main area of activity (development and improvement) is again one ECSA's main pillars of [15].

2.2.6 Engineers Australia

An integral part of EA is to publicly advocate on issues that affect the profession and the broader community. EA, like many other engineering bodies, is positioned as the voice of the engineering profession through government, community and media advocacy. According to [16], reforms and investment are needed in Australian infrastructure innovation with a particular focus on the three areas outlined below:

1. Project governance and planning

The institute recommends that collaborative, long-term planning of infrastructure is vital to economic prosperity. Governments at all levels must commit to continuous improvement through best-practice project governance, planning, procurement and delivery.

2. Best practice procurement

The institute also emphasises that infrastructure projects are mostly medium- to long-term endeavours, making procurement processes difficult. Tendering and contracting issues regularly prevent small to medium-sized enterprises from equitable participation. A way to encourage more diverse participation is to develop baseline infrastructure first, with a structured return on investment, before proceeding to the next level of value-adding infrastructure. Ensuring that project bidders are shortlisted promptly can also assist by limiting the time and money spent by companies identified as unsuitable.

3. Digital infrastructure and innovation

A broad uptake of digital technologies at all phases of asset lifecycles would enhance productivity in infrastructure delivery and operation. The use of digital twins, smart sensors, building information modelling systems, digital engineering and digital asset management tools will ensure

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Australia is future-ready and that its infrastructure can be managed efficiently, sustainably, and effectively.

The following recommendations for productivity improvements in government-funded infrastructure projects in Australia have been made:

- Governments must commit to long-term, collaborative planning to mitigate the negative effects of short-term electoral cycles on infrastructure planning and delivery.
- Government and industry should develop an infrastructure industry best-practice guide mandating key policies to optimise benefits and minimise risk in infrastructure project management, delivery and operations.

2.2.7 Engineering New Zealand

Through its Engineering a Better New Zealand programme, ENZ provides input to the government on infrastructure development. The institute aims for greater influence with government and industry to inform and shape the engineering policy agenda. The institute also provided input to the New Zealand Infrastructure Commission's consultation document called "Infrastructure for a Better Future". The institute provides commentary on a wide range of infrastructure bills such as the draft New Zealand Rail Plan as well as the Water Services Regulator Bill [17].

2.2.8 Hong Kong Institute of Engineers

In addressing issues around infrastructure development, HKIE has set up a task force to research the foreseeable workload and the local engineering workforce supply in the coming decades. The institution provides status on the required engineering workforce to cater for the anticipated significant shortage of human workers to meet the boost in infrastructure development and uplift of Hong Kong's status as a technology and innovation hub [18].

HKIE puts forward suggestions on streamlining building works and infrastructure development processes to help fast track the whole development cycle, mainly focusing on the downstream submission and approval process during the design and construction stages of projects/developments. HKIE also makes suggestions to government on curtailing tenderers from making very low bids which could lead to poor working environments for engineering

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professionals, especially younger ones, which may deter them from joining the profession, affect project programmes and trigger quality, health and safety issues [19].

2.2.9 Engineers Canada

EC advocates on issues that impact the engineering profession and have government relations initiatives that enable its members to contribute to public policy. Part of EC's purposes is to advocate to the federal government and actively monitor, research and advise on changes and advances that impact the Canadian regulatory environment and the engineering profession. The advocacy is done through issuing statements and national position statements, which are concise and cover topics such as climate change, artificial intelligence, infrastructure, procurement of goods and services, etc., by stating the challenges and how EC could contribute and by providing recommendations to the federal government. It also has a committee that does public affairs advisory work by doing research and publishing government submissions to ensure that government considers engineering advice when it makes decisions that impact infrastructure and the engineering profession. Since 2011, EC has provided government submissions through pre-budget speech consultations and presenting recommendations to government. EC inputs into the next federal budget and delivers federal budget analysis and highlights after the budget speech. Additionally, EC provides the number of citizens and immigrants to make government aware of the number of engineers it has and future projections for new engineering graduates, etc.

EC forces its involvement in infrastructure development issues by promoting its position statements through government submissions, approaching the government on issues that impact the engineering profession, participating in government consultations with members of parliament and public servants and presenting before parliamentary committees. ECSA could adapt how EC responds and get involved in key national infrastructure initiatives [20].

2.2.10 Canadian Council of Technicians and Technologists

CCTT is the national organisation that focuses on promoting and advancing the profession of technologists and technicians in different areas of engineering. CCTT also established and maintains the National Technology Benchmarks in partnership with the National Council of Deans of Technology and the Council of Registrars, which is the first outcome-based criteria for national

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accreditation and certification. It offers professional designation IntETn and IntET (Canada) to engineering technicians and technologists under the IEA to applicants who are already certified as engineering technicians and certified engineering technologists in Canada [21]. According to [21], CCTT is not a regulatory body.

2.2.11 Association for Evaluation and Accreditation of Engineering Programs

As a non-governmental organisation, MUDEK's mission is to enhance the quality of engineering education through accreditation and evaluation, and information services of engineering education programmes in different disciplines, to get better educated and qualified engineers who will advance the welfare of society [22].

MUDEK is recognised by the higher education council as the national quality assurance agency specialising in the national, sectoral and programme specific competency of engineering programmes at higher education institutions; it issues the Quality Evaluation and Registration Certificate. The criteria for the engineering programmes closely follow ABET (Accreditation Board for Engineering and Technology). MUDEK only evaluates and accredits engineering programmes, similar to ECSA.

2.2.12 The Institution of Engineers, Singapore

IES is the premier engineering institution in Singapore and as such, is often called upon by the government to provide feedback on professional engineering matters. The IES was appointed by Enterprise Singapore, the national standards body, as the Standards Development Organisation to provide secretariat support for the Building and Construction Standards Committee (BCSC) from January 2015, and the Technical Committee on Railway Systems from March 2020.

The BCSC supports the quality, safety and productivity initiatives in the Singapore building and construction industry. The committee also supports standardisation development in emerging areas of importance in Singapore such as smart infrastructure and green buildings. Through its magazine (the Singapore Engineer), the institute publishes reports on various engineering matters as a way to inform the public about the developments in the country including infrastructure issues [23].

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2.2.13 Engineering Council United Kingdom

ECUK is one of the partner institutions under the Royal Academy of Engineering (RAE) with other professional engineering organisations. RAE is one of the four United Kingdom (UK) national academies; it brings together engineers for a shared purpose to advance and promote excellence in engineering. It provides expert advice and policy support to government. Further, it takes the lead on engineering education and invests in the UK's world class research base to underpin innovation and growth [24].

The RAE has a policy and resource centre called the national engineering policy centre. It includes different forums such as education policy, engineering policy, research and innovation. It supports policy makers in the public sector, diversity and inclusion, and policy publications. According to [25], the National Engineering Policy Centre's mission is to provide practical policy advice on national and global challenges through collaboration with 42 professional engineering organisations. In 2020, the academy and its partners in the National Engineering Policy Centre were commissioned by the Government's Chief Scientific Adviser, Sir Patrick Vallance FRS FMedSci, to identify the interventions needed in the UK's built environment and transport systems to reduce infection transmission and protect public health during and beyond the Covid-19 pandemic [25]. The policy centre has published many reports on how engineering can reduce air pollution, decarbonisation in the construction industry, public projects and procurement in the UK, and many reports on issues that impact the country and engineering industry. Some of the research makes recommendations on how issues related to engineering could be done better; the council also advises the government when it drafts policies.

ECSA could adopt what ECUK is doing by championing the response to key national infrastructure initiatives through the CBE, which is similar to the RAE in the UK. ECSA has to work together with other regulatory bodies in the built environment and respond to government initiatives through the CBE.

2.2.14 Accreditation Board for Engineering and Technology

ABET is a non-governmental organisation that accredits post-secondary education programmes in applied and natural sciences, computing, engineering and engineering technology at the

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associate, bachelor and master's degree levels [26]. The National Society of Professional Engineers (NSPE) is the regulatory body for the engineering profession. It is one of the members of the society of ABET, which sets policy, develops strategy and conducts accreditation activities for the engineering profession. The NSPE has an advocacy and government relations centre with different work groups focusing on climate change – sustainability and resilience, emerging technologies such as artificial intelligence and autonomous vehicles, and infrastructure development [27]. ABET also produces policy guides and position statements on how to approach some of the recommendations and research output.

2.3 Summary

The literature review has revealed that most of the activities performed by international engineering regulatory institutions are covered under ECSA's core functions of registration, accreditation, development of engineers and regulation of the profession. The examples from Australia, Ireland, Canada, UK and Japan are worth emulating. For example, being vocal and advocating for the profession and its contribution to social, environmental and economic development. ECSA could strive to provide advice in the form of commentary on policy issues, good project governance and planning in all infrastructure development issues before they are published. Further, it could publish on various aspects, including infrastructure report cards, professional practice, government policies and guidelines, and legal issues. Lastly, ECSA could publish information on best practices for project management of infrastructure projects and on procurement practices.

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3. RESPONSES FROM THE FOCUS GROUP AND SURVEY

3.1 Introduction

This section presents the responses from the focus group and survey, and a discussion of the findings.

3.2 Findings

3.2.1 Focus group

Within the Department of Public Works and Infrastructure, many infrastructure projects have been initiated; an example of a programme called the integrated renewable energy and resource efficiency programme was mentioned as a good starting point for where ECSA could participate. The department has 92 000 facilities that are running in the country where there are issues with energy and solid waste management. Some facilities are in drought-stricken areas so solid waste management is a challenge. It was viewed that ECSA could participate and aid with research on green buildings for practical solutions which could be applied to resolve these issues. ECSA could partner with universities that are already researching areas where the government faces challenges; funding for this type of work is already available in the form of fees for feasibility studies.

Furthermore, a suggestion was made that ECSA should partner with Voluntary Associations (VAs) such as the South African Institution of Civil Engineering (SAICE), South African Institute of Electrical Engineers (SAIEE), etc. to be proactive in responding to infrastructure initiatives. It was also suggested that the South African Academy of Engineering, which is not affiliated with ECSA, is doing a lot of work on power generation. Therefore, it is critical for ECSA to collaborate with such institutions. Another suggestion made was that ECSA could partner with the office of the Auditor-General to assist with auditing infrastructure projects.

3.2.2 Survey

The structured online questionnaire results showed agreement that engineering professionals should be given an opportunity to serve on boards and councils of parastatals that implement

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infrastructure projects to provide oversite on procurement and project management. ECSA's responsibility should be to ensure that expertise is deployed accordingly.

3.3 Discussion

ECSA has a role to play in the infrastructure initiative arena, which means guidelines need to be drawn up guidelines on how this could be done. Possible areas include developing, establishing and providing monitoring on technical and industry standards for infrastructure development. ECSA could also play a role in enforcing professionalism in infrastructure development and provide advice in the form of commentary on government policies and planning concerning infrastructure projects. ECSA could also publish information on infrastructure report cards, required capacity in the profession and best practices. There is also the need for ECSA to advocate for the use of technology in infrastructure development to assist the country in transitioning from a historically closed mineral economy to an open and integrated, low carbon economy. ECSA should strive to provide effective leadership and direction on infrastructure initiatives and partner with VAs such as SAICE and SAIEE to contribute to any infrastructure initiatives.

4. CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

It is evident from the background study that ECSA must be an active participant in infrastructure initiatives because it is the custodian of the engineering profession in the country. This would likely contribute to South Africa's transition from a historically closed minerals economy to one that is integrated, both globally and in terms of regulation, and lead to appropriate, effective, sustainable and stable technical and decision-making capacity for infrastructure delivery.

ECSA should continue to develop, establish, provide, monitor and enforce professional technical industry standards. Furthermore, engineering professionals should be given the chance or opportunity to participate in infrastructure initiatives to provide leadership and direction, and to use their knowledge and skills in the project life cycle. It must provide leadership and technical support to ensure high standards of productivity and good governance, which would in turn likely

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lead to attracting higher investment in infrastructure development projects for much needed economic growth.

4.2 Recommendations

Based on the findings of the study on ECSA's response to key national infrastructure initiatives, the following recommendations are made:

- ECSA should emulate what other international regulatory bodies are doing by being proactive, vocal, and advocating on issues that impact the engineering profession.
- ECSA must focus and advise the government on the engineering skills shortage and pipeline, national infrastructure plan 2050, budget speech, procurement practices, government policies, white papers, infrastructure bills, etc.
- ECSA should consider partnering with the department of the Auditor-General to assist with auditing infrastructure projects.
- ECSA should collaborate with VAs for infrastructure research projects.
- ECSA should provide capacity by providing its database of registered persons who offer specialist engineering skills which are scarce in South Africa.
- ECSA should engage with the Department of Public Works and Infrastructure, which is the custodian of infrastructure projects in South Africa. This would assist ECSA to provide the necessary advice on best practices for executing infrastructure projects.

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	Revision Date	Revision Details	Approved By
Draft A	31 March 2023	A complete report from the Research Business Unit	EL Nxumalo
Draft B	04 April 2023	Customization to ECSA format and preparation for approval by RPSC	EL Nxumalo
Rev. 0	13 April 2023	Consideration and approval	RPSC
Rev. 0	02 June 2023	Consideration and approval	Council

Research Report on ECSA's response to the key national infrastructure initiatives

Revision 0, dated 13 April 2023, consisting of 25 pages was reviewed for adequacy by the Business Unit Manager and is approved by the Executive: Research, Policy and Standards **(RPS)**.

Business Unit Manager — Date: 2023/06/19

Executive: RPS — Date: 2023/06/19

This definitive version of this research report is available on our website.

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