

CESA Consulting Engineers South Africa

Overview of the Engineering Profession in South Africa

CESA 2011 Conference & Exhibition



Engineering Council of South Africa

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Presentation Outline

- I. Globalization of Engineering
- II. National Challenges: Dinokeng Scenarios & National Plan by NPC
- III. South Africa's Global Competitiveness Ranking & Eng Skills base (Profile & Production of Eng. Professionals)
- IV. Why regulate the Eng. Profession and What does it entail?
- V. ECSA's Contribution to addressing National Imperatives





I. Engineering's Contributions of the 20th Century

- Electrification
- Motorcar
- Airplane
- Water supply & distribution
- Electronics
- Radio and television
- Agricultural mechanisation
- Computers
- Telephone (fixed & mobile)

- Intercity highways & bridges
- Space flight
- Internet
- Low cost housing
- Household appliances
- Air conditioning & Refrigeration
- Health technologies
- Petrochemical technologies
- Laser and fiber optics
- Nuclear technologies
- High-performance materials





Some Engineering Grand Challenges

- Provide access to clean water
- Improve urban infrastructure
- Engineer better medicines
- Advance health informatics
- Counter nuclear terror
- Secure cyberspace

- Make solar energy economical
- Provide energy from fusion
- Enhance virtual reality
- Manage the nitrogen cycle
- Advance personalised learning





Globalization of Engineering: Boeing 787 Dreamliner



PARTS NOT SHOWN

Landing gear Messier-Dowty (England)

Wing/body fairing Boeing (Canada)

Landing gear doors Boeing (Canada)

Cargo access doors Saab (Sweden)

Passenger entry doors Latecoere (France)

Engines GE (Evendale, Ohio)

Engines Rolls-Royce (England)

Engine nacelles Goodrich (Chula Vista, Calif.)



II. What then are the big challenges we face ?



3 FUTURES FOR SOUTH AFRICA





Our Challenges: Political







Our Challenges: Political

Do we have the will to build one nation across racial and class divides?

How do we manage race in a non-racial society?

Have we drawn on the skills and talents of all South Africans?



Our Challenges: Economic



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Our Challenges: Economic

Persistent poverty

- 40% of households extremely poor

"You can't participate in the economy or in politics if you are concerned with survival"



Our Challenges: Social



50% of 20-24 year olds are unemployed

- High prevalence of HIV / Aids
- Drug abuse
- Domestic violence



Our Challenges: Health

Decreasing life expectancy - from 63 in 1990 to 50 in 2007



Source: Statistics SA 2001 = 2008



Our Challenges: Health & Skills



 Acute skills shortages and lack of accountability

"People don't believe that medicines will be in the clinics."



Our Challenges: Education



Nearly half of schools still lack critical infrastructure

High school drop-out rates

"Only 29% of those who start school leave with a Matric Certificate"



Our Critical Challenges





Nine challenges to eliminating poverty & reducing inequality

- 1. Too few South Africans work
- 2. The quality of school education for most black people is sub-standard
- 3. Poorly located and inadequate infrastructure limits social inclusion and faster economic growth
- 4. Spatial challenges continue to marginalise the poor
- 5. South Africa's growth path is highly resource-intensive and hence unsustainable



Nine challenges to eliminating poverty & reducing inequality

- 6. The ailing public health system confronts a massive disease burden
- 7. Performance of public service is uneven
- 8. Corruption undermines state legitimacy and service delivery
- 9. South Africa remains a divided society





Nine challenges: NPC

1. Too few South Africans work

Table I.I: Unemployment rate by age, percentage (2002-2010)

Age cohort	2002	2004	2006	2008	2010
15 – 24	55.9	51.8	50.2	46.6	51.3
25 – 34	34.1	29.8	28.5	26.2	29.1
35 – 44	21.0	18.2	18.2	16.6	17.8
45 – 54	16.1	11.9	12.4	9.3	12.4
55 – 65	0.0	7.2	6.9	6.5	7.3
Total	30.4	26.2	25.5	23.2	25.4

Source: Development Indicators based on Labour Force Survey (Sept figures only)





DIAGNOSTIC OVERVIEW

Nine challenges: NPC

2. The quality of school education for most black people is sub-standard

Distribution of high schools by performance in Senior Certificate for Mathematics; 2004





DIAGNOSTIC OVERVIEW

Nine challenges: NPC

6. The ailing public health system confronts a massive disease burden.

- South Africa has 0.6 percent of the world's population, 17 percent of the world's HIV infections and 11 percent of the world's tuberculosis cases.
- There is a scourge of trauma cases resulting from violence and road accidents (injury death rate of 158 per 100 000 population is nearly twice the global average).
- Infant and maternal mortality rates (43 per 1000 live births and 625 per 100 000 live births respectively) are extremely high and higher than other middle income countries.
- Non-communicable diseases such as diabetes and heart disease are rising sharply (non-communicable diseases in 2004 relative to baseline value in 1997 showed a fivefold increase).



Commission

DIAGNOSTIC OVERVIEW

The NPC's Plan for South Africa's Economy

- Create 11 million jobs by 2030, reducing the unemployment rate to 6% from 25%
- 90% of new jobs to be created by small and expanding private companies
- Reduce the ratio of households living below a monthly poverty line of R418 per person to zero from 39%
- Inequality measured by the Gini co-efficient to fall to 0.6 from 0.7 in 2009 (0 is minimum and 1 is maximum inequality)

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The NPC's Plan for South Africa's Economy (2)...

- The economy should grow by an average annual rate of 5.4% nearly trebling in size by 2030
- Exports should grow by 6% a year, with non-traditional exports growing by 10% a year
- Investment measured by gross fixed capital formation should rise to 30% of gross domestic product (GDP) from 17%
- Savings ratio to rise to 25% of GDP from 17%





The NPC's Plan for South Africa's Economy (3)...

- Provide clear certainty over property rights, tax treatment and mineral rights in mining sectors
- Simplify procedures for probation and dismissal in labour market
- Simplify and even eliminate employment equity and skills development regulations for small firms.
- Share burden of shift to job creating growth through all sectors of society

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Further challenges at local government level

- Lack of basic infrastructure
- Housing backlog
- Poor access to water and electricity
- Ageing cohort of engineering professionals
- Corruption

Lack of engineering skills contributes to these challenges and lack of delivery to communities.



III. So then how does South Africa rank against its global competitors?



The Global Competitiveness Report 2010-2011





Competitiveness Model





Countries at each stage

Y

ECSA

Zambia

Zimbabwe

Stage 1	Transition from 1 to 2	Stage 2	Transition from 2 to 3	Stage 3
Bangladesh	Algeria	Albania	Bahrain	Australia
Benin	Angola	Argentina	Barbados	Austria
Bolivia	Armenia	Bosnia and Herzegovina	Chile	Belgium
Burkina Faso	Azerbaijan	Brazil	Croatia	Canada
Burundi	Botswana	Bulgaria	Estonia	Cyprus
Cambodia	Brunei Darussalam	Cape Verde	Hungary	Czech Republic
Cameroon	Egypt	China	Latvia	Denmark
Chad	Georgia	Colombia	Lithuania	Finland
Côte d'Ivoire	Guatemala	Costa Rica	Oman	France
Ethiopia	Guyana	Dominican Republic	Poland	Germany
Gambia, The	Indonesia	Ecuador	Puerto Rico	Greece
Ghana	Iran, Islamic Rep.	El Salvador	Slovak Republic	Hong Kong SAR
Honduras	Jamaica	Jordan	Taiwan, China	Iceland
India	Kazakhstan	Lebanon	Trinidad and Tobago	Ireland
Kenya	Kuwait	Macedonia, FYR	Uruguay	Israel
Kyrgyz Republic	Libya	Malaysia		Italy
Lesotho	Morocco	Mauritius		Japan
Madagascar	Paraguay	Mexico		Korea, Rep.
Malawi	Qatar	Montenegro		Luxembourg
Mali	Saudi Arabia	Namibia		Malta
Mauritania	Sri Lanka	Panama		Netherlands
Moldova	Swaziland	Peru		New Zealand
Mongolia	Syria	Romania		Norway
Mozambique	Ukraine	Russian Federation		Portugal
Nepal	Venezuela	Serbia		Singapore
Nicaragua		South Africa		Slovenia
Nigeria		Thailand		Spain
Pakistan		Tunisia		Sweden
Philippines		Turkey		Switzerland
Rwanda				United Arab Emirates
Senegal				United Kingdom
Tajikistan				United States
Tanzania				
Timor-Leste				
Uganda				
Vietnam				

South Africa's Global Competitiveness Ranking

Key indicators, 2009

Population (millions)	50.1
GDP (US\$ billions)	
GDP per capita (US\$)	5,824
GDP (PPP) as share (%) of world total	0.70

Stage of development





South Africa's Global Competitiveness Index

	Rank (out of 139)	Score (1–7)
GCI 2010–2011	54	4.3
GCI 2009–2010 (out of 133)	45.	4.3
GCI 2008–2009 (out of 134)	45.	4.4
Basic requirements		4.4
1st pillar: Institutions		4.4
2nd pillar: Infrastructure	63.	4.0
3rd pillar: Macroeconomic environment	43.	5.0
4th pillar: Health and primary education	129.	4.1
Efficiency enhancers		4.4
5th pillar: Higher education and training	75.	4.0
6th pillar: Goods market efficiency	40.	4.5
7th pillar: Labor market efficiency		4.1
8th pillar: Financial market development	9.	5.3
9th pillar: Technological readiness	76.	3.5
10th pillar: Market size	25.	4.8
Innovation and sophistication factors	43	3.9
11th pillar: Business sophistication		4.4
12th pillar: Innovation		3.5



Problematic factors for doing business





Comparison of Citizens per registered Engineer





Allyson Lawless: Numbers and Needs (2005)

Actual & Targeted graduate output



An analysis of the 2001 national intake cohort of engineering students at SA HEIs.

	Graduated within 5 years	Still registered after 5 years
4 year Bachelor's (Eng)	54%	19%
National Diploma (Eng)	17%	14%



Scott, I., Yeld, N., & Hendry, J. (2007). A case for improving teaching and learning in South African higher education. Pretoria: Council on Higher Education (CHE) and Higher Education Quality Committee (HEQC), http://www.che.ac.za/documents/d000155/index.php.

% of Eng. students who graduate within 5 yrs

	Black African	White
4 year Bachelor's (Eng)	32%	64%
National Diploma (Eng)	16%	28%



Scott, I., Yeld, N., & Hendry, J. (2007). A case for improving teaching and learning in South African higher education. Pretoria: Council on Higher Education (CHE) and Higher Education Quality Committee (HEQC), http://www.che.ac.za/documents/d000155/index.php.

2. Shape and size of SA Engineering professionals

No. of Engineering Professionals per age group

Category	Age	Quantity
Professional Engineer	25-40 (1)	2635
Professional Engineer	41-50 (2)	3015
Professional Engineer	51-60 (3)	3228
Professional Engineer	61-70 (4)	2428
Professional Engineer	71 (5)	3685
Professional Engineering Technologist	25-40	1096
Professional Engineering Technologist	41-50	1003
Professional Engineering Technologist	51-60	935
Professional Engineering Technologist	61-70	541
Professional Engineering Technologist	71	305
Professional Certificated Engineer	25-40	82
Professional Certificated Engineer	41-50	238
Professional Certificated Engineer	51-60	425
Professional Certificated Engineer	61-70	193
Professional Certificated Engineer	71	117
Professional Engineering Technician	25-40	1462
Professional Engineering Technician	41-50	563
Professional Engineering Technician	51-60	303
Professional Engineering Technician	61-70	76



Professional Engineers age Profile





Professional Technologist Age Profile





Professional Technician Age Profile





Register of Engineering Professionals By Race

		Race			
Category	Total	M/F-India	M/F- Africa	M/F- Coloured	M/F- White
Professional Engineer	15 083	673	951	142	13 317
Professional Engineering Technologist	3964	336	563	140	2925
Professional Certificated Engineer	1167	42	39	8	1078
Professional Engineering Technician	2501	203	1218	123	957
TOTAL @ 31 October 2011	22 715	1254	2771	413	18 277



Professional Engineers

	Total	Female	African	Coloured	Asian	Whites
Agricultural	196	4	5			191
Chemical	827	94	49	7	82	689
Aeronautical	49	1	0	2	3	44
Civil	6409	161	270	46	181	5912
Mechanical	2969	35	157	26	112	2674
Electrical	3648	118	393	58	262	2935
Mining	504	3	44	1	12	447
Metallurgy	310	21	28	1	17	264
Industrial	171	20	5	1	4	161
	15083	457	951	142	673	13317



Professional Engineering Technologists

Discipline	Total	Female	African	Coloured	Asian	Whites
Agriculture	11	-	1	1	-	9
Chemical	62	17	31	8	11	12
Civil	1799	55	197	61	198	1343
Electrical	1307	28	213	44	82	968
Industrial	16	1	2	1	3	10
Mechanical	690	15	98	25	42	525
Metallurgy	51	6	12	-	-	39
Mining	28	-	9	-	-	19
Total	3964	122	563	140	336	2925



IV. Why regulate the Engineering profession?

- Engineering work..... is accompanied by risks to health, safety, environment, & sustainability
- Engineering work must therefore be carried out by competent and accountable registered professionals

- Registration is a method of recognising the competency of engineering practitioners and ensuring accountability
- Engineering Professions Act, No. 46 of 2000

ECSA



ECSA's Core Functions

- Set Standards for Engineering Qualifications
- Accreditation of Engineering programmes
- Recognise and Evaluate Qualifications
- Register Engineering Professionals
- Renew Registration & Continuing Professional Development
- Define and Enforce a Code of Conduct for Registered Professionals
- Define guidelines fees for Professional Engineers Services



Purpose of Registration

Objective	Method
•To give the public confidence in competence of registered practitioners	 the Accredited education Assessing competence of applicants for registration
•To regulate practice of registered persons	•Self-regulation by adherence to code of conduct
	•CPD requirement to maintain registration
	 Accountability for their conduct through a complaints, investigation and tribunal process
•To ensure that engineering work risks is performed by registered persons	 •Definition of work requiring the competence of registered person

Requirements for Registration

- 1. Demonstrate that education requirement has been satisfied by:
 - Holding a qualification accredited by ECSA; or
 - Holding a qualification recognised by international agreement; or
 - Be evaluated or assessed as substantially equivalent
- 2. Have at least 3 years training and experience after graduation
- 3. Apply for registration
 - Provide documented and certified evidence of competence against the standard for registration from engineering work
 - Undergo peer-assessment: document-based and interview



Profiles of Professional Categories



The Extended Engineering Team



- Various Engineering activities require above role players in different measure
- Engineer, Engineering Technologist & Engineering Technician are defined as professional categories in the EP* Act
- Lift Inspectors & Lifting Machinery Inspectors under OHS Act



*Engineering Profession Act No 46, 2000

Engineering Practitioner Lifecycle



ECSA Register of Engineering Professional: ~ 37 000





Relationships in the Profession





ECSA Stakeholder Relations



V. ECSA's Contribution to addressing National Imperatives

- ECSA Council's New Strategic Plan adopted March 2010
- New Strategic Objectives
 - (5) quality of engineering education, the competence of engineering practitioners and professional conduct,
 - (2) quantity of engineering practitioners must be increased,



- (4) effective operations of the organization

Quantitative Strategic Objectives Specified

- Determine engineering skills requirements for the country and provide direction and solutions to the pipeline for engineering skills development; and "Improving Throughput in the Engineering Bachelors Degree"
- Ensure the marketing of the profession to educate and attract learners to build the future engineering skills pipeline. www.engenius.org.za



Re-alignment of ECSA's Structure

ENGINEERING COUNCIL OF SOUTH AFRICA

PROPOSED ORGANOGRAM



- Project 1- Candidacy Phase.
- Project 2 Registration of Foreign practitioners in SA
- **Project 3 Skills Pipeline**
- Project 4 Value Statements.
- Project 5 Transformation.



ECSA Engineering Summit 2011

- Purpose of the Summit.
- Three Focus Areas of the Summit
 - Skills Pipeline

"Improving Throughput in the Engineering BSc Degree"

- Candidate Phase Challenges
- National Infrastructure Provision



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Dankie - Enkosi - Ha khensa - Re a leboga - Ro livhuwa - Siyabonga -Siyathokoza - Thank you



- Project 1- Candidacy Phase.
- The problems facing candidates in preparing for professional registrations are **much wider that mentorship and also include things such as lack of opportunity of** gaining the required experience. Statistics regarding the number of candidates that are unable to obtain professional registration, even after seven years, are of great concern.
- The team should therefore consider all aspects of candidacy programmes.



- Project 2 Registration of Foreign practitioners in SA
- Although new infrastructure projects were identified as a specific area of concern this problem cuts across all spheres of engineering. In view of the scarcity of engineering skills it is expected that the problem would only escalate in future.
- Once engineering work has been identified, ECSA will have to take a much more proactive role in assisting and ensuring that the right calibre of candidates are "imported" and that there is processes in place to facilitate registration.



- Project 3 Skills Pipeline
- This encompasses a wide range of initiatives spanning school, university and candidacy phases of the education and training of engineering practitioners. It includes but is not limited to career guidance, advice on training facilities, mentoring, streamlined registration processes, best practices and industry needs. In all probability this Project Team will also have to include representation or at least input from the Voluntary Associations.



- Project 4 Value Statements.
- This Project Team's main task would be to define a value statement taking into account the value accruing to each set of stakeholders.
- •
- Council took note of these initiatives at its meeting held on 17 March 2011 and also noted that the Committee and CEO would identify suitable persons to lead the projects. Council further noted that most of these initiatives would require some research and that ECSA would have to provide such a support.



• Project 6 – Engenius



- Engenius aims to grow and transform the Engineering profession through promoting:
- National collaboration, coordination and support amongst organisations involved in advancing the engineering profession.
- The engineering profession to primary and high school learners in order to attract sufficient numbers of suitably educated learners that represent the demographics of SA.
- New programmes which are required to support the purpose.
- Initiate activities such as marketing and securing funds to support the above objectives.



www.engenius.org.za