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SOUTH AFRICAN ROAD FEDERATION

KwaZulu-Natal Region

The Road Network in KZN: Helping Enhance the Economy and Mobility

Developing Adequate Professional Expertise in the Roads Sector

Presented By: Tom McKune

Outline of Presentation

- Introduction
- Some Background
- Previous Research Undertaken
- The Role Players
- Examples of Best Practice
- Some Thoughts on a Way Forward.

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Introduction

The Ideal Capacity Scenario

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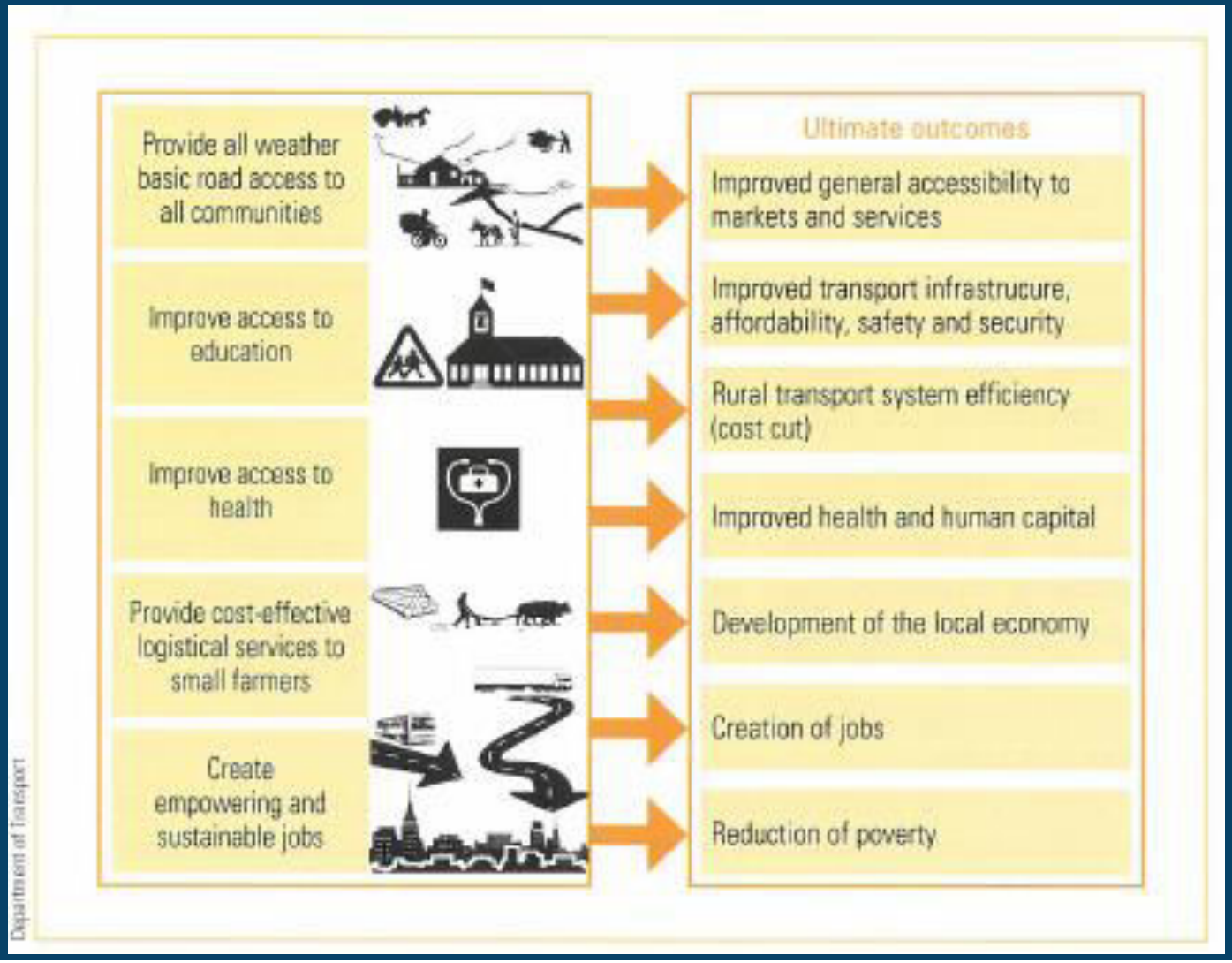
The Role of the Public Sector



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Technical

Geometric Design ***(including Expropriation)***	**Traffic Engineering** ***(including Road safety & Signage)***
Bridge Design	**Pavement Design & Materials** ***(including well equipped testing laboratories)***
Contract Documentation & Administration	**Construction & Maintenance**

Implementation

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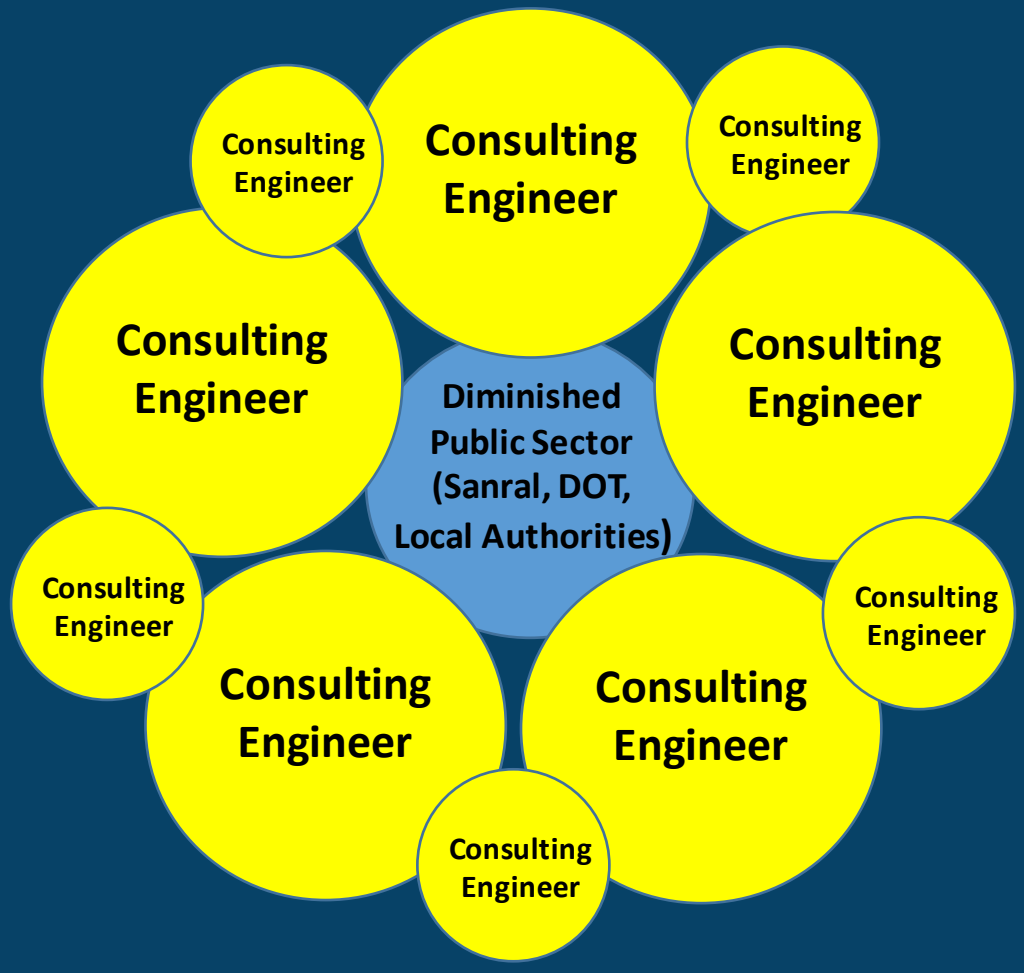
The Current Capacity Scenario



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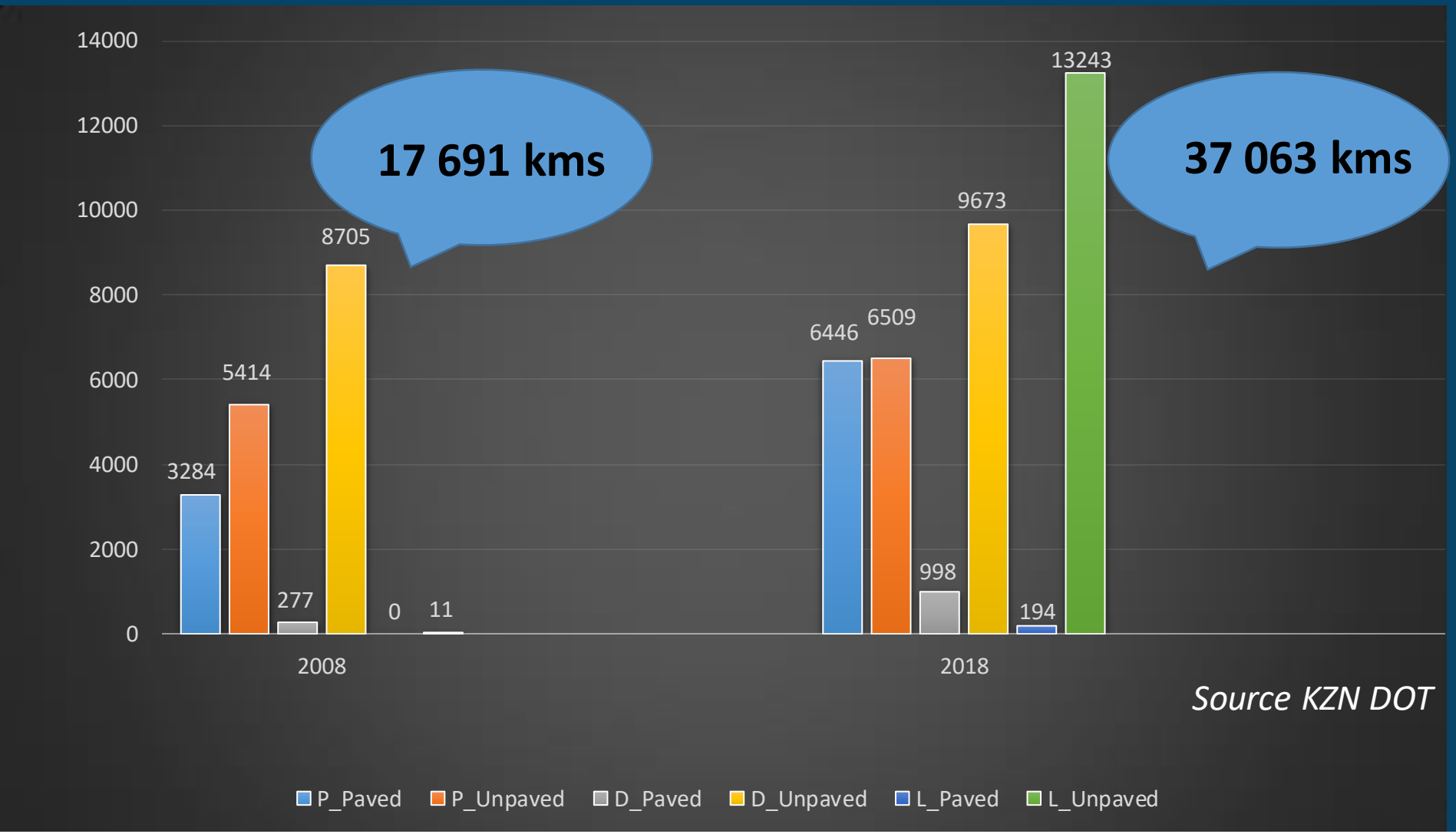
Some Background



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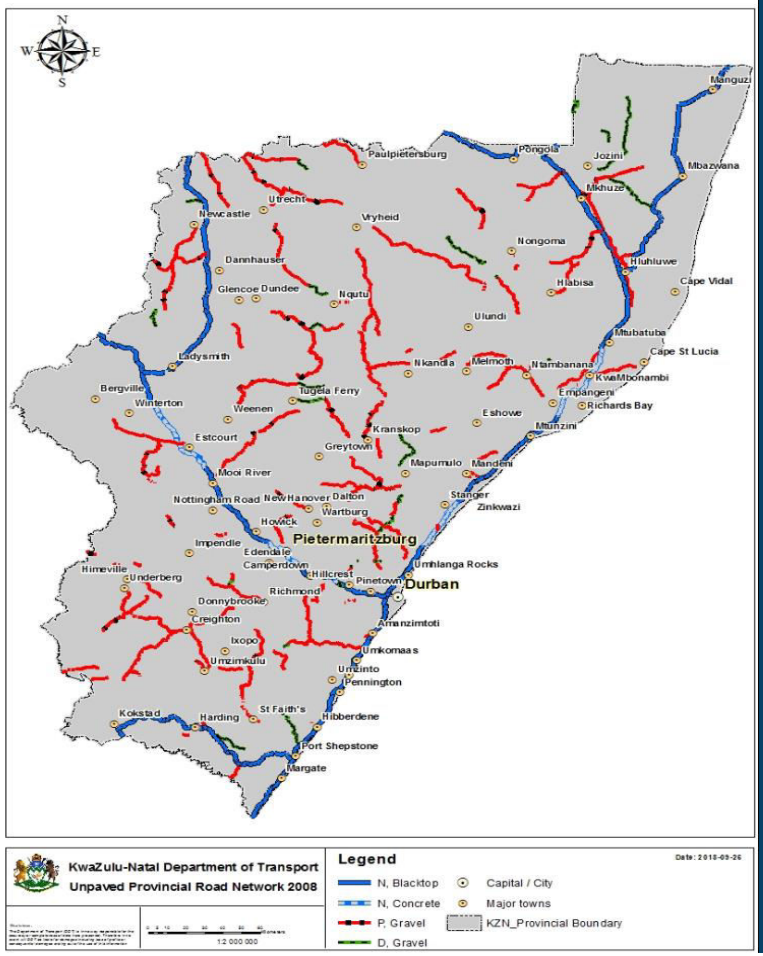
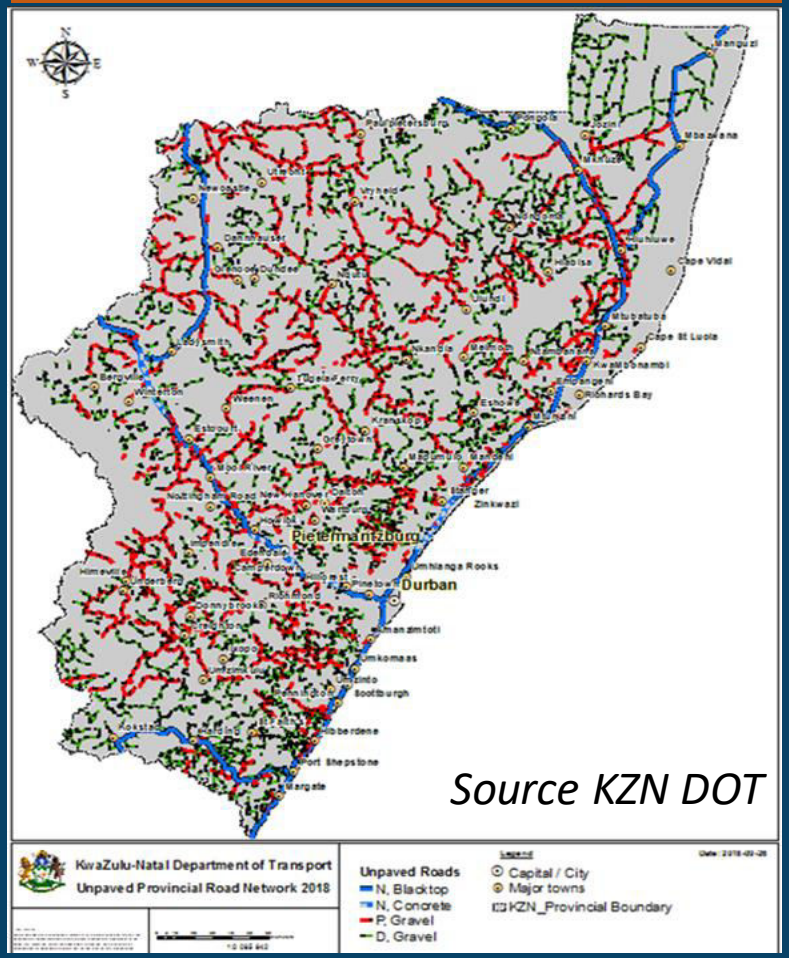
DECLARED UNPAVED ROAD NETWORK

- 2008



- 2018



Source KZN DOT

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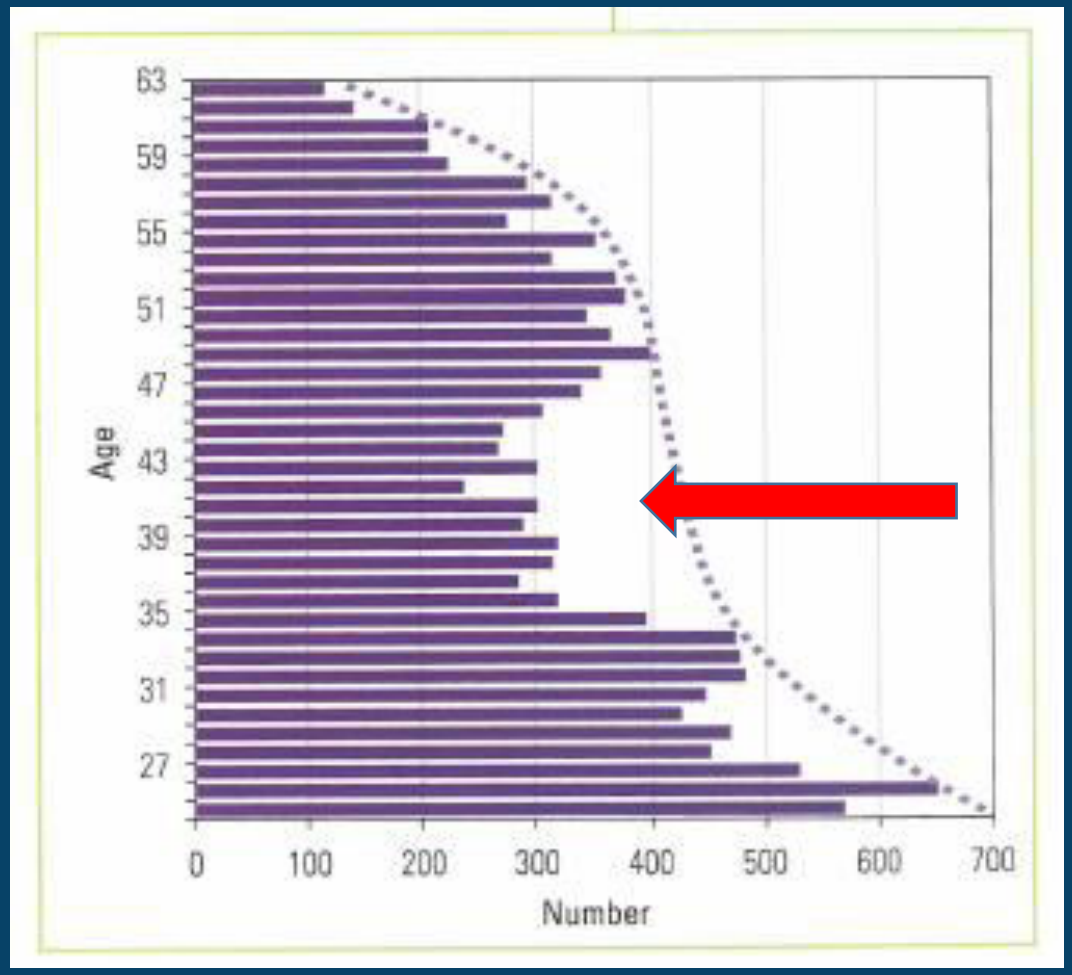
Previous Research Undertaken *(Numbers and Needs)*



Overall profile of civil engineering professionals by age and number, 2004 *(Numbers & Needs SAICE 2005)*

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	2005	2006	2007	2008	2009	2010
Gains						
BSc/BEng	135	165	175	195	205	205
National diploma	435	485	520	500	500	500
Immigration	40	40	50	50	45	40
Total	**610**	**690**	**745**	**745**	**750**	**745**
Losses						
Leave the industry including premature deaths	121	124	124	126	127	127
Emigrate	220	230	210	210	210	210
Early retirement	106	46	60	64	56	71
Retirement	145	209	106	181	238	255
Total	**592**	**609**	**500**	**581**	**631**	**663**
NETT	**18**	**81**	**245**	**164**	**119**	**82**

Source Numbers and Needs SAICE 2005

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This projection was primarily based on the World Cup related projects, and pre-dated SIPS!

Source Numbers and Needs SAICE 2005

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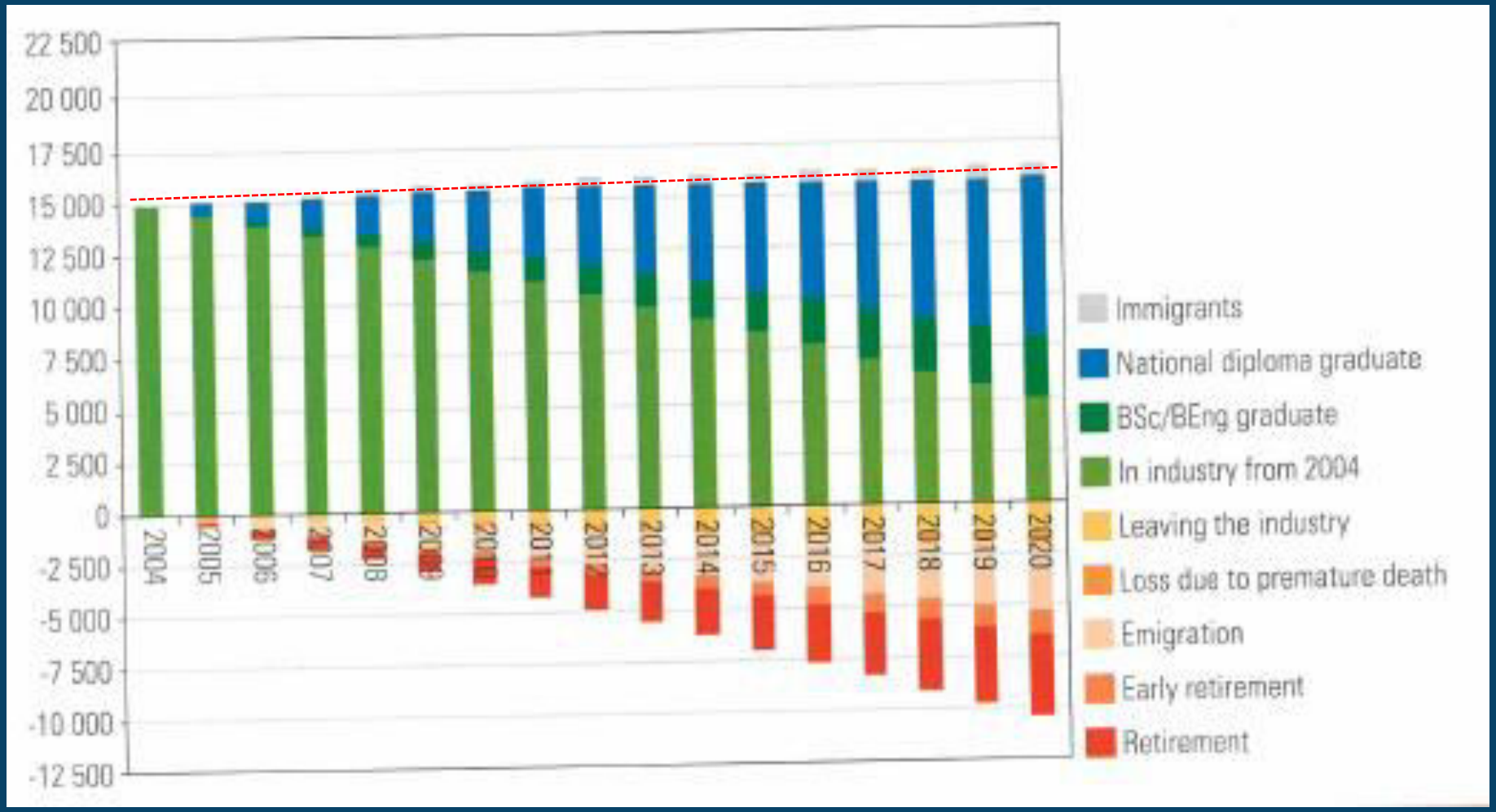

Civil Engineering Capacity – the "Do Nothing" approach

Source Numbers and Needs SAICE 2005

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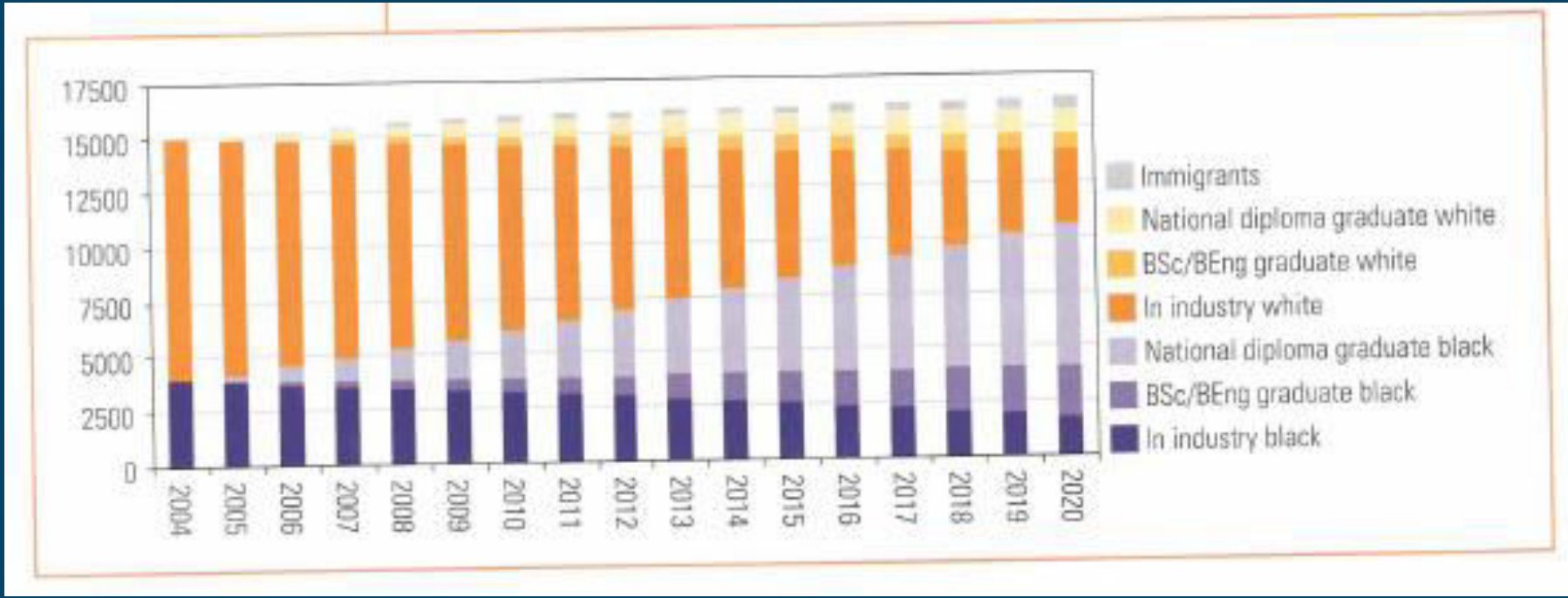

Transformation in Civil Engineering

Source Numbers and Needs SAICE 2005

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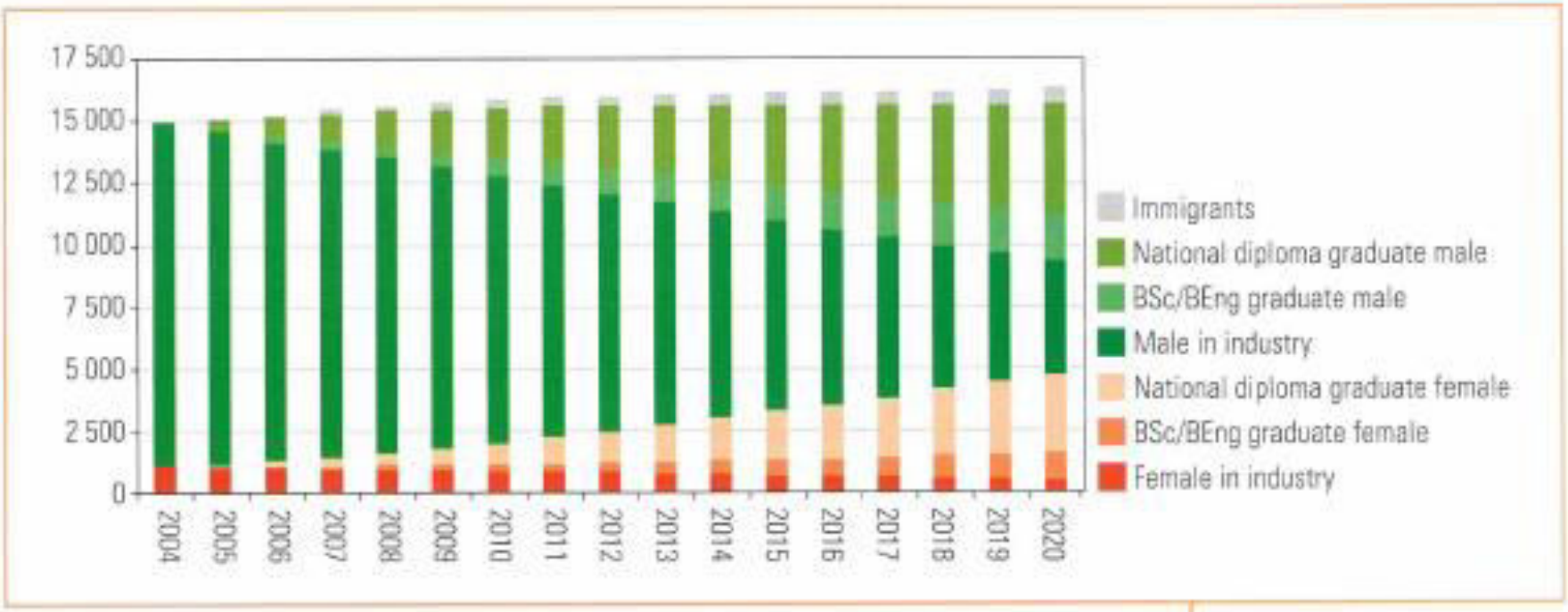

Gender in Civil Engineering

Source Numbers and Needs SAICE 2005

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So what makes a good *Padmaker*!

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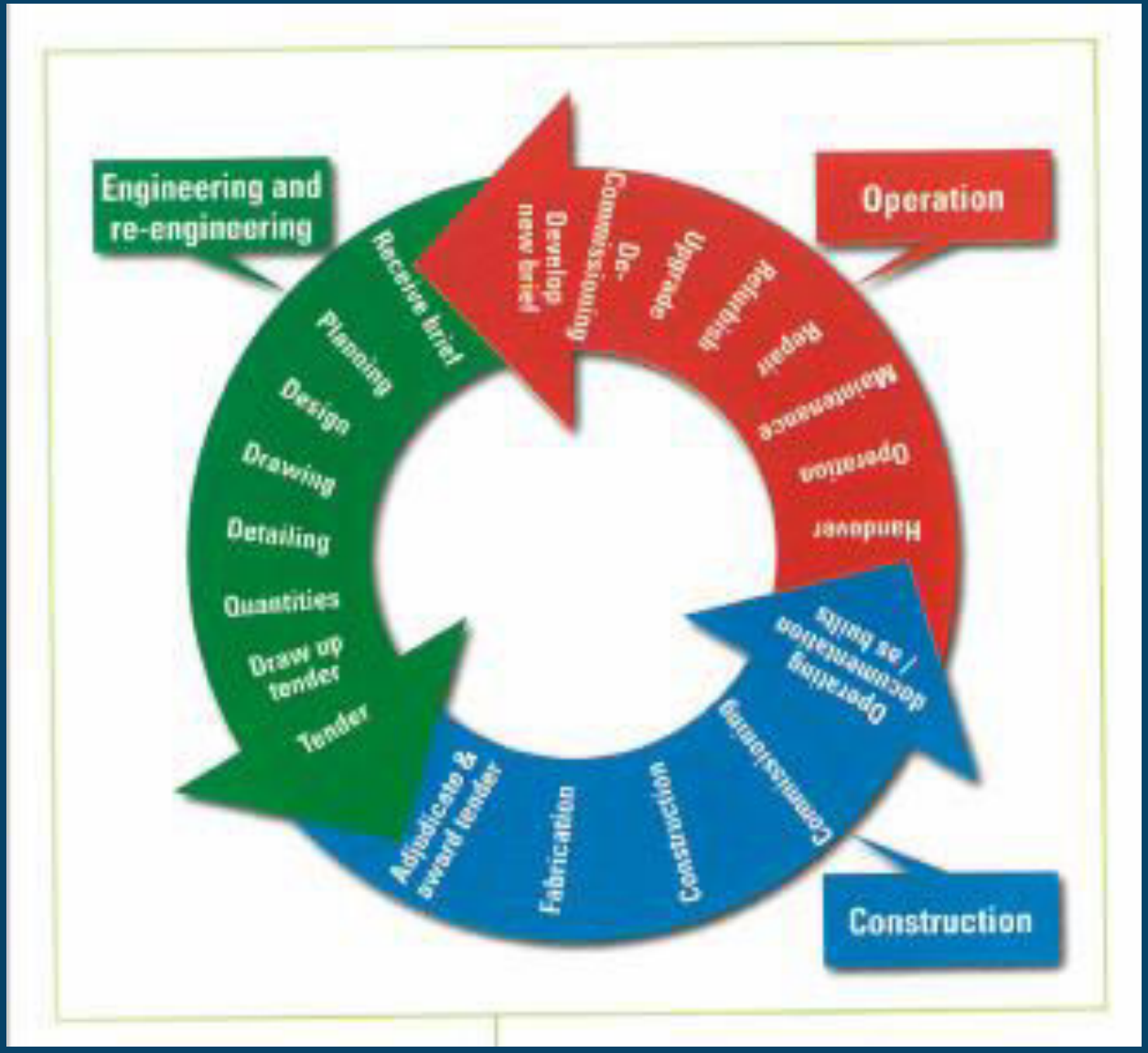

Solid Understanding and experience in the project life cycle

Source Numbers and Needs, SAICE 2005

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The Key role Players

- Government *(ie the public sector)* – and the primary source of funding
- Education
- Industry *(Consultants & Contractors)*
- ECSA
- VA's

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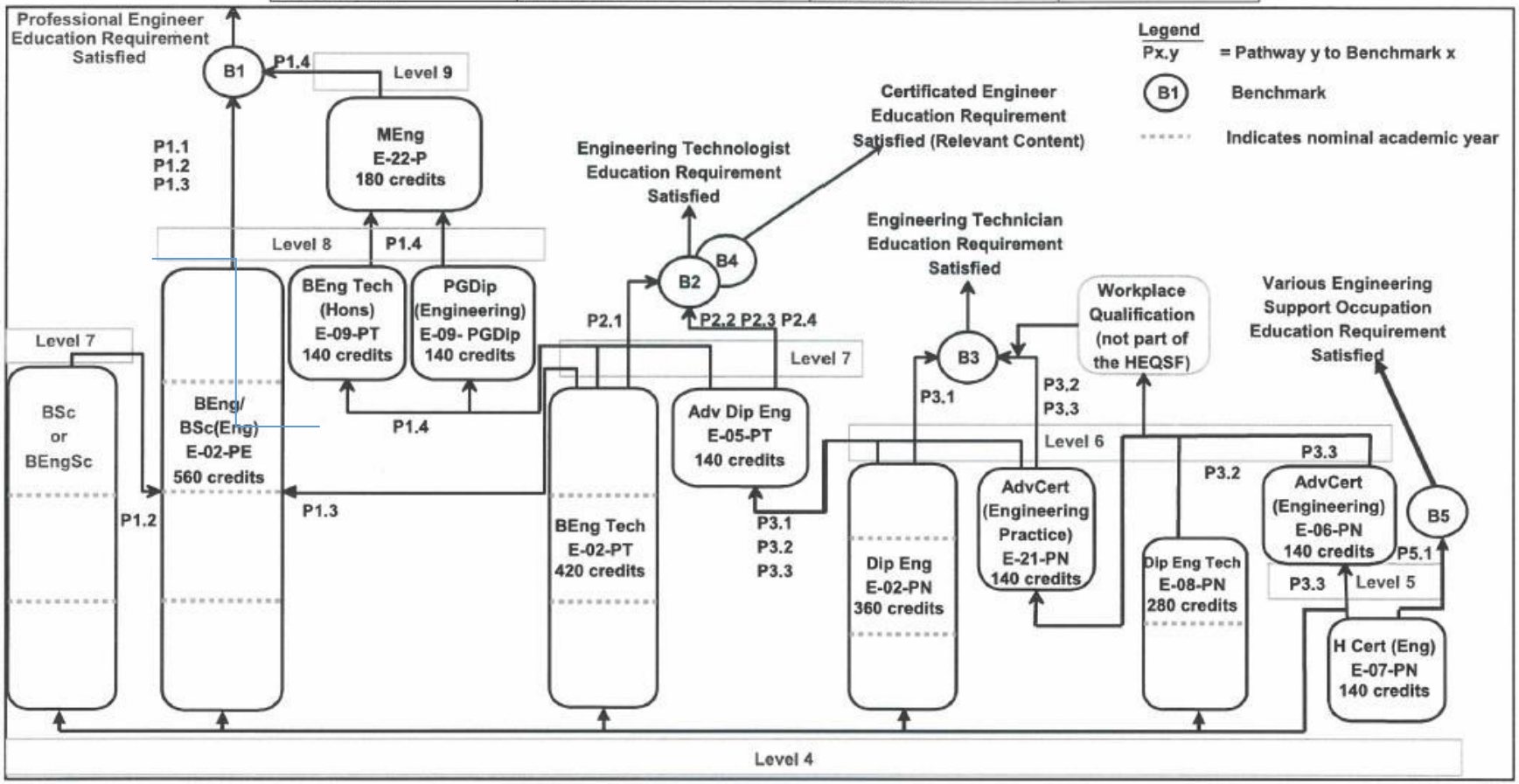

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Graduate Attributes (ELO's):

GA 1: identify, assess, formulate and **solve engineering problems**	**GA 6: communicate** effectively, both orally and in writing, with engineering & wider audiences
GA 2: use **math, basic science & engineering science** knowledge to solve engineering problems	**GA 7: assess impact** of engineering activity on social, industrial & physical environment
GA 3: perform **design and synthesis** of solutions	**GA 8:** knowledge of **engineering management** and to work effectively as an individual, in teams.
GA 4: design and conduct **investigations** and experiments	**GA 9:** engage in **independent learning** through well developed learning skills.
GA 5: use appropriate engineering methods, **skills and tools**, including those based on IT	**GA 10: act professionally and ethically**, exercise judgment and take responsibility within own limits

360 Diploma also has ELO 11: WIL

Internationally Aligned Profiles

Professional Engineers (L8)	**Professional Engineering Technologists / Certificated Engineers (L7)**	**Professional Engineering Technicians (L6)**
are characterised by:		
Solve complex problems: *Unfamiliar problems with large uncertainty and many conflicting constraints*	Solve broadly-defined problems: *Problems with some uncertainty and conflicting constraints*	Solve well-defined problems: *Concrete problems with few conflicting constraints that can be*
Use sophisticated strategies and tools to design and oversee potentially very complex systems, components and processes	Execute design functions and contribute to the design of systems, components or processes	Use design recipes to execute simple design functions

Washington Accord

Sydney Accord

Dublin Accord

C.P.F.

Cram
Pass
Forget

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P.P.R.

Prepare
Pass
Remember

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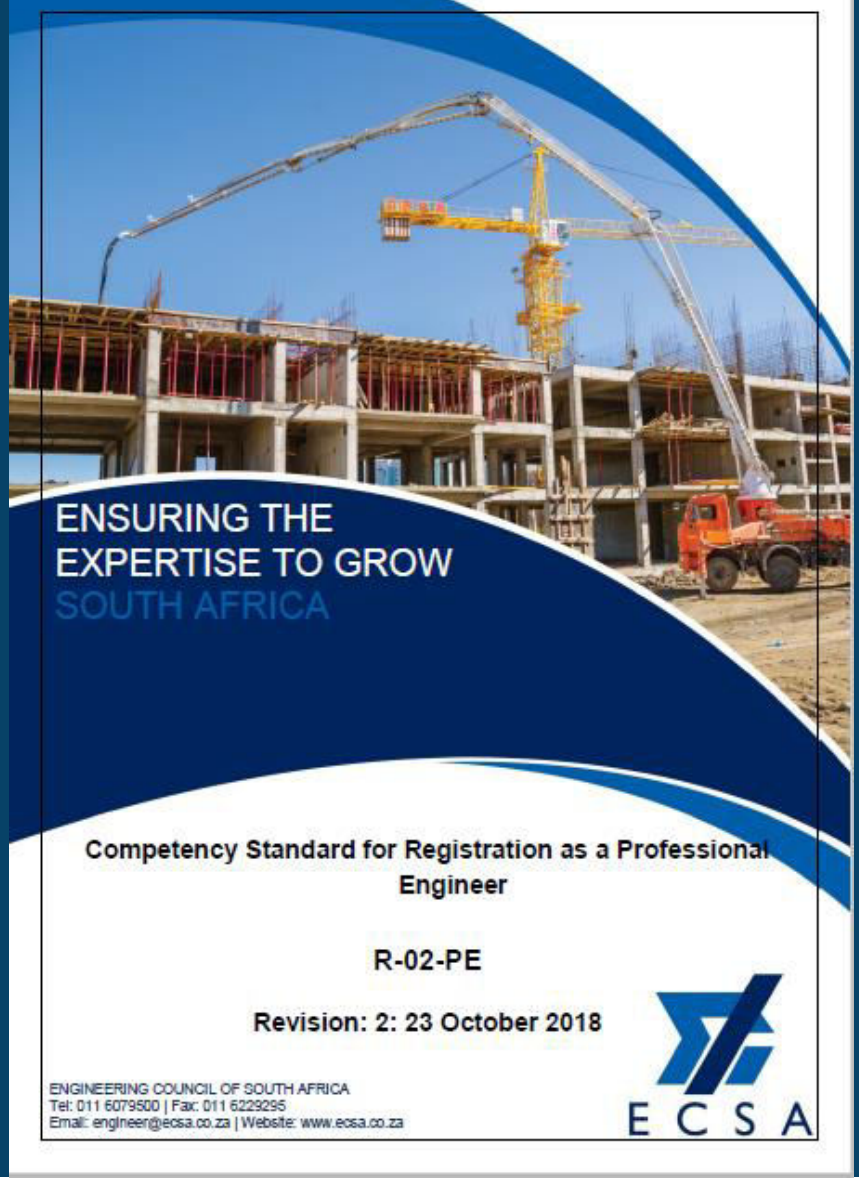

The Elephant in the Room!

Professional registration is an indication of competence and should thus be encouraged to have a strong sector.

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REGISTRATIONS REQUIREMENTS

Professional Competence Outcomes

GROUP A – Engineering Problem Solving

Engineers	Technologists/ Certificated Engineers	Technicians	Specified Categories
A:1: Define, investigate and analyse complex engineering problems	A:1: Define, investigate and analyse broadly-defined engineering problems	A:1: Define, investigate and analyse well-defined engineering problems	A:1: Define, investigate and analyse specifically-defined engineering problems
A:2: Design or develop solutions to complex engineering problems	A:2: Design or develop solutions to broadly-defined engineering problems	A:2: Design or develop solutions to well-defined engineering problems	A:2: Design or develop solutions to specifically-defined engineering problems
A:3: Comprehend and apply advanced knowledge: ….	A:3: Comprehend and apply advanced knowledge: ….	A:3: Comprehend and apply advanced knowledge: ….	A:3: Comprehend and apply advanced knowledge: ….

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REGISTRATIONS REQUIREMENTS Cont'd

Professional Competence Outcomes

GROUP B – Managing Engineering Activities

Engineers	Technologists/ Certificated Engineers	Technicians	Specified Categories
B:4: Manage part or all of one or more complex eng. activities	B:4: Manage part or all of one or more broadly-defined eng. activities	B:4: Manage part or all of one or more well-defined eng. activities	B:4: Manage part or all of one or more specifically-defined eng. activities
B:5: Communicate clearly with others …. In complex eng. activities	B:5: Communicate clearly with others …. In broadly- defined eng. activities	B:5: Communicate clearly with others …. In well defined eng. activities	B:5: Communicate clearly with others …. In specifically-defined eng. activities

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REGISTRATIONS REQUIREMENTS Cont'd

Professional Competence Outcomes

GROUP C – Impacts of Engineering Activities

Engineers	Technologists/ Certificated Engineers	Technicians	Specified Categories
C:6: Recognise and address the reasonably foreseeable impacts	C:6: Recognise and address the reasonably foreseeable impacts	C:6: Recognise and address the reasonably foreseeable impacts	C:6: Recognise and address the reasonably foreseeable impacts
C:7: Meet all legal and regulatory requirements …	C:7: Meet all legal and regulatory requirements …	C:7: Meet all legal and regulatory requirements …	C:7: Meet all legal and regulatory requirements …

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REGISTRATIONS REQUIREMENTS Cont'd

Professional Competence Outcomes

GROUP D – Act ethically, Exercise judgement and taking responsibility

Engineers	Technologists/ Certificated Engineers	Technicians	Specified Categories
D:8: Conduct engineering activities ethically.	D:8: Conduct engineering activities ethically.	D:8: Conduct engineering activities ethically.	D:8: Conduct engineering activities ethically.
D:9: Exercise sound judgement in the course of complex eng. activities	D:9: Exercise sound judgement in the course of broadly-defined eng. activities	D:9: Exercise sound judgement in the course of well-defined eng. activities	D:9: Exercise sound judgement in the course of well-defined eng. activities
D:10: Be responsible for making decisions in complex eng.activities	D:10: Be responsible for making decisions in broadly-defined eng.activities	D:10: Be responsible for making decisions in well- defined eng.activities	D:10: Be responsible for making decisions in well-defined eng.activities

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REGISTRATIONS REQUIREMENTS Cont'd

Professional Competence Outcomes

GROUP E – Initial Professional Development (IPD)

Engineers	Technologists/ Certificated Engineers	Technicians	Specified Categories
E:11: Undertake initial professional development	E:11: Undertake initial professional development	E:11: Undertake initial professional development	E:11: Undertake initial professional development

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The challenge *(particularly in the Public Sector)* is to provide an enabling environment where newly graduated *(and quite a few who have been in our industry for some time)* can be exposed to the RIGHT types of work *(projects)* to ensure they are able to satisfy the outcomes briefly covered above.

Although most consultants are better able to provide the required exposure to achieve the ECSA outcomes, they do so under greatly increasing pressure given the shortage of work, and more critically the whole issue of discounting of fees!!

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Examples of Best Practice

Sanral established the Technical Excellence Academy (TEA) in 2013, initiated by the Southern Regional Manager *(Mbulelo Simon Peterson),* supported by other senior Sanral staff who felt the need to build up in-house design/technical capability.

The TEA is fully funded by Sanral *(although efforts have been made to source additional funding from other sources without success).*

Sanral originally targeted their own bursary students, who had graduated and had a work-back contract with Sanral, and to facilitate the process of registration with ECSA.

Sanral established a core training programme *(see next slide),* which started as a theoretical approach, but this has evolved to being more hands on using actual regional project imperatives to train the staff *(ie they do actual work).*

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The TEA programme consists of four (4) distinct phases;

- ❑ **Design** ***(ideally 21 months, part of which may be as secondee to a specific project)***
- ❑ **Materials Testing Laboratory** ***(ideally 3 months but with emphasis on the interpretation of results rather than doing the testing)***
- ❑ **Site** ***(1 year)***
- ❑ **Project Manager-in-training** ***(until the bursary linked contract ends or approx. 2 years)***

As can be seen this is not a quick fix approach *(ie is done over a five (5) year period).* They have achieved seven (7) Pr.Eng and two (2) Pr Tech Eng ECSA registrations.

Has created a technical space within a Roads Authority where ideas are nurtured and young graduates are exposed to an array of projects, issues and senior practitioners.

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The KZN DOT have invested heavily in trying to get more of their permanent staff, and many of their qualified bursary students registered. This has had mixed results, with many of the permanent staff reluctant to make the effort to get registered, and some of the successes being lost to natural attrition and these staff moving on to the Private sector *(86 registrations of which 21 were with Plato, but 14 of these have left).*

The KZN DOT have also realized that they need to have a strong technical base in-house and have started the process of re-establishing their design "offices" so opportunities can be created internally for the training of staff on "real" projects to help achieve the ECSA outcomes – this initiative is strongly supported.

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Some Thoughts on a Way Forward

A regional Training Initiative involving all role players *(similar to the Sanral TEA)* model needs to be established, it is suggested that SARF and other VA's act as the "honest broker" in this endeavor to get the wheels in motion.

Acknowledge that Universities are a National asset, and should be part of the solution, and active partners with the Public sector, Industry and the VA's *(do together what is impossible to achieve individually)*.

Acknowledge that a strong roads sector is in the best interest of our Province, our economy, and the broader community in general – but requires a back to basics approach, and unity in the sector.

The Ceta and other similar entities to be approached to assist with funding the initiative over the long term.

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Thank you

Questions?

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