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Chapter 7

Absenting the absence of parallel learning pathways for intermediate skills: The 'missing middle' in the environmental sector in South Africa

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Introduction

Environment and sustainability are continually recognized for significance to the future of planetary well-being. But the complex, cross-cutting transversal nature and associated 'newness'ⁱ of environment and sustainability concerns within education and training systems raise a number of challenges for education and training systems. In this chapter I explore how critical realist dialectics can help to more fully explain the absence of intermediate pathways in the environment and sustainable development 'sector' in South Africa and through this analysis raise opportunities for creating more seamless environmental learning pathways into green jobs, enhancing social justice potential and public good concerns.

The chapter situates the discussion within the South African policy discourse of meaningful learning pathways (South Africa. Department of Higher Education and Training [DHET], 2010) through a study of two priority scarce skills occupations in the environmental sector (environmental scientist and environmental technician). This

is used as an example to illustrate systemic disjunctures that illustrate how environmental learning pathways in and for sustainable development emerge. Using a critical realist lens to understand the absences that denote a relationship away from being allows the chapter to conceptualize absence as central to the real and hence to being (Lotz-Sisitka and Ramsarup, 2012; Bhaskar, 1993). Privileging absence allows me to develop a vantage point that connects being to becoming and hence underlines the intent for change inherent within this research. Norrie (2010, p. 28) states that “understanding change as a process of absenting of absences as well as the absenting of those structural constraints that keep absences in place ... lies at the core of change”.

Introducing learning pathways

Within South Africa where 3 200 000 young people in 2010 did not gain access into post-school education, Cloete and Butler-Adam (2012) highlight the landscape that paints the picture for access. They argue that there are two and half times the number of people out of education as there are in education within the 18-25 year old cohort. Against this background, the notion of seamless learning pathways has been integral to the emergence of the South African National Qualifications Framework (NQF), with its foundational commitment to objectives of facilitating access, mobility and progression within education, training and career path development, as reflected in the NQF Act No 67 of 2008 (Republic of South Africa [RSA], 2009) and the underpinning NQF objectives (Allais, 2009; RSA, 2009). The Cloete and Butler-Adam (2012) insight into the scope and scale of lack of access, progression and mobility, especially amongst youth in South Africa, provides some foundation for thinking through, and understanding a multiple pathway framework that incorporates broad options, non-traditional pathways as well as second chance pathways. All these will enable broader access to post-school education, which Hoppers (2009) argues is essential for transformation in Africa.

A rapidly emerging Green Economy discourse in South Africa, and elsewhere has elevated the profile of environment as an economic driver (South Africa. Department of Environmental Affairs [DEA], 2010a; Maia et al., 2011), pointing out that learning pathways into environmental jobs need more careful consideration. Envisaged environmental practices cross elementary, intermediate and high skills levels and will

therefore require varied and multiple learning pathways. This will necessitate transversal engagement across the NQF as sustainability practices are located across schooling, higher education, and occupationally directed training (Lotz-Sisitka, 2011). This emerging scenario means that tomorrow's jobs will be different from those we know today which has implications for in-service up-skilling and re-skilling, as well as for new learning pathways development. As interest in the opportunities presented by the green growth path escalates, so too is the recognition that investment in green skills planning is critical for long-term performance of a greener and more sustainable economy and society. This requires a reconceptualizing of environmental skills development needs and skills development planning systems need to prepare themselves for an emergence of non-traditional, new and multidisciplinary environmental learning pathways.

More broadly however, and of relevance to the critical and emancipatory interest in this research, is the point made by Death (2014) about the emergence of the Green Economy in South Africa. He suggests that there is a need to consolidate a particular kind of commitment to the Green Economy that should ideally be pursued in a manner that does not produce "...new power relations of inequality and injustice" (p.1). In this chapter, I argue that central to this would be the manner in which the green economy emergence enables capacity building and skills development in South Africa in a sustained, socially just manner, within a concept of sustainability that incorporates economic possibilities for the poor and marginalized, and wider public good interests and concerns such as conservation of biodiversity. In proposing this I suggest a concept of sustainability that encompasses the flourishing of all, now and in future.

A critical realist dialectical lens on environmental learning pathways research

Critical realism proposes a three-part "depth ontology of the real (structures, underlying generative mechanisms), the actual (phenomena and events, generated by underlying structures/ causal mechanisms) and the empirical (phenomena and events experienced by the knowing subject)" (Bhaskar, 1993; Norrie, 2010). This underlabouring enabled me to explore a perspective that goes beyond the colloquial currency that the concept of learning pathways has gained in South African education

policy which has focused mainly on 'pathway engineering' which represents fairly 'flat, actualist accounts...', or a 'purely positive account of reality' (Bhaskar, 1993, p. 400).

This chapter draws on absence as the primary category of dialectical critical realism is the conceptual tool this chapter; it sets out to investigate the deep-seated absences and the dialectical process of change that a focus on absence can enable. This prioritizes absence as a central concept in being and implies that presence is inherently part of absence hence giving primacy to absence. The Bhaskarian dialectic is concerned with the "absenting of constraints on absenting absences or ills" (Bhaskar, 1993, p. xxxiii). Bhaskar's (1993) use of the term 'absence' refers to "absence of an entity (including structures and mechanisms, events, and experiences) at any level of any region (including being)" (Shipway, 2011, p. 94). This helps one to conceive of being as a process of becoming.

Bhaskar (1993) argues that change must be conceptualized in terms of absence as absence is ontologically prior to presence, which means that any world capable of change contains absences, and agency can thus be viewed as an act of absenting (Shipway, 2010, p. 96; Bhaskar, 1993, p. 240). Bhaskar (1993) recommended identifying *absences*, as both real absences (things that are simply not there, e.g. the economic structures that enable green learning pathways), through real possibility (e.g. exploring how it might be possible to support the emergence of learning pathways through green jobs analysis and assessments or other possibilities) and then realizing these in practical terms (i.e. actually implementing green training, once conceptualized). Absence therefore becomes a way of beginning to conceptualize what Bhaskar (1993) terms 'eudemonia', or a better society as is anticipated via environment and sustainability thinking and praxis. In adopting a position of absenting absences we take the perspective that surfacing and removing the constraints will allow what already exists to be.

To help me identify the absences, I drew on Bhaskar's idea that existence of an absence of an entity (including structures, mechanisms, events, experiences) is

possible at any level or any region – the entity could be absent from the region as Shipway (2011 p. 94) suggests. It may be:

- Never anywhere – does not exist
- Sometimes someplace else – finite existence
- Spatio-temporally distant – means it was away for now... (drawing on Bhaskar, 1993, pp. 38-39)

Drawing on this framework, to understand what is absent in the South African skills system context, I was able to look at what is present somewhere else e.g. studying how occupations are differentiated in agriculture, gave me opportunities to understand what is absent in the environmental sector, or to study qualification routes within engineering helped me to understand the nature of what is absent within the environmental sector. Exploring how absences may be spatio-temporally distant, or present elsewhere, helped me to formulate possibilities, re-imagine practices and conceptualize a more coherent learning pathways framework for environmental skills in South Africa.

The dialectical critical realist perspective necessitates in-depth research and deliberation that requires one to look beneath the empirical (the way a learning pathway is shaped or not shaped). Thus I have utilised a more complex notion of learning pathways as neither completely individualistic nor wholly structurally determined. The concept of learning pathways used in this study is informed by the social realist recognition that structures precede human actions *and* that agents may influence structures and exercise reflexivity as they ‘make their way through the world’ (Archer, 2000; Bhaskar, 1975; Archer, Bhaskar, Collier, Lawson and Norrie, 1998). Based on this emergent view of human development, the perspective on learning pathways used in this chapter recognises that systemic and structural factors shape learning pathways in certain ways, but agents (the individual learner or other corporate agents) may shape the learning pathways in certain ways too.

Understanding the presence of an absence

This chapter takes a critical look at provisioning for intermediate skill needs in the

environmental sector. 'Intermediate skills' is defined by the National Qualifications Framework (NQF) as people whose qualifications are sandwiched below university-acquired 'high skill' degrees but above the entry-level skills and qualifications (Kraak, 2008). The Organising Framework for Occupations (OFO) classification classes this group as "workers who perform a variety of skilled tasks applying broad or in-depth technical, trade, or industry specific knowledge, often in support of scientific, engineering, building, manufacturing and processing activities" (South Africa. DHET, 2012).

The Environmental Sector Skills Plan for South Africa (South Africa. DEA, 2010a) as well as the South African Green Accord (South Africa. Department of Economic Development [DED], 2011) have highlighted a shortage of over 1 500 environmental technicians in South Africa at present indicating a severe shortage of technical skills in the public sector, where such skills are critical to service delivery. This was further corroborated by the Local Government Sector Education and Training Authority (LGSETA, 2012) Sector Skills Plan (SSP) which highlights that shortages of artisans in certain trades are widely reported and municipal planning functions (urban planning, local economic development and environmental planning) are all currently underserved. It reports further that municipal technical services and engineering services are coming under increased pressure as the demand for service delivery increases (*ibid.*, p. 37). The Energy and Water Sector Skills Plan (EWSETA, 2012) and the Culture, Arts, Tourism, Hospitality and Sport Sector Education and Training Authority Sector Skills Plan (CATHSSETA, 2012) both report that the technical intermediate cohort is by far the largest section of its employee base (Ramsarup, *in press*).

The research reported on here sought to explore how the technical, intermediate skilled cohort in the environmental sector is being catered for within the systems of provisioning. It sought to probe what types of pathways exist and how occupational progression for this cohort is envisaged. To understand this, I explored some of the platforms of provisioning and how these are articulated within the education and training system. Although multiple generative mechanisms and system factors impact on pathways, the chapter opens up only a selected few of these.

- *Occupational differentiation (or the absence thereof)*

The Organisational Framework Occupations (OFO) is a coded occupational classification system. The OFO groups jobs into occupations based on similarity of tasks, skills and knowledge. This grouping provides a common language across the system when talking about occupations (South Africa. DHET, 2012). Diagram 7.1 below shows how some of the occupations in one environmental sector are grouped according to different codes and categories that show different levels of occupation. Related to this, is the National Occupations Pathways Framework (NOPF), which reflects progression pathways across the different major groups of the OFO. The NOPF clusters into occupational families and occupational clusters to show occupational progression and articulation. These clusters inform employers, human resource professionals, education and training professionals of potential progression pathways and career pathways which assist occupational qualification developers to lay the foundation for vertical progression when developing occupational qualifications.

INSERT FIGURE 7.1.

Figure 7.1: Depiction of occupational families as reflected on NOPF (an example of occupational families)

The example represented above, depicts how NOPF works and how well developed occupational pathways can be represented showing opportunities and linkages for occupational progression.

A careful study of the most recent OFO (South Africa. DHET, 2012) reflects a growing emergence of new environmental occupations as compared to earlier versions e.g. Environmental Impact and Restoration Analyst and Environmental Engineer, but these occupations reflect mainly at the high skills / professional levels. What emerges is a picture of a highly skilled sector, and there is fairly extensive coverage of high skilled professional occupations reflecting the growing specialization in the sector (South Africa. DHET, 2012).

Of concern, however, is the fact that there is *very little representation of environmental occupations at intermediate and elementary skill levels*. Considering this elite, high skills phenomenon more critically, retroductively one might hypothesize that (at the level of the real) modern social institutional arrangements and cultural beliefs assume that all natural resources are or can be owned. Therefore, resource management is, and has clearly become the preserve of the elite (the owners of the resources) (Martinez-Alier, 2002), just as managing the economy is only for the owners of the businesses. With this worldview predominating in modern capitalist systems, why would a refuse collector need to understand environmental issues? They simply need to know how to follow orders and the elite management will make sure that they protect the environment. Under this scenario (of globalized capital), environmental training for low /medium level workers in a factory becomes reduced to knowledge of the rules and safety/health and environmental management systems, and neglects more complex forms of environmental knowledge which in many instances is simply ignored or not engaged with in training at all, as shown in some empirical studies (e.g. Mohanoe, 2013). Understanding the presence of such a glaring absence in a national system context is, as argued in this chapter, important for mapping out possibilities for transformative praxis.

What is visible at the level of the empirical, is that environmental occupations are scattered, extremely poorly differentiated, and are not visible across levels of skill. For example, the occupational descriptions and titles listed under environmental science technician (which is the primary environmental occupation in the technical major group) suggest unclear connections to higher and lower skill levels, creating the impossibility of a 'seamless' learning pathway as envisaged by policy. This fragmented occupational differentiation contained in a major policy implementation instrument of the state, surprisingly reflects an imprecise picture of feeder occupations (currently only possible feeder elementary occupations listed are Rubbish Collector; Refuse Sorter; Waste Material Sorter or environmental practices inspector) into the environmental technician occupation and unclear linkages exist into professional occupations e.g. Environmental Scientist. This is despite the fact that these occupations have been identified as being scarce and in high demand in a range

of other policy documents such as the national scarce skills list, and the sector skills plan of the Sector Education and Training Authorities.

This reveals lack of engagement with, and poor knowledge of the systems of practice at intermediary occupation levels in the environmental sector, leading to poor occupational differentiation. This in turn has the effect that the occupations are often mapped incorrectly by Human Resources (HR) personnel, which in turn affects how funding is allocated for training, and access to training. This is in stark contrast to more established economic sectors like agriculture. For example, the occupation of farmer is highly differentiated (see below), and all occupational differentiations are listed with independent OFO codes, meaning that Sector Education and Training Authorities and HR personnel can allocate training funding to these occupations:

- *Agronomy farmer*
- *Field and vegetable farmer*
- *Tree and shrub farmer*
- *Aboricultural farmer*
- *Ornamental Horticultural farmer*
- *Mixed crop Farmer*
- *Livestock Farmer*
- *Dairy Farmer*
- *Poultry Farmer*
- *Insect Farmer*
- *Game Farmer*
- *Aquaculture Farmer*

All of the above represent only a snapshot of the occupational range of farmer as listed in the OFO (South Africa. DHET, 2012) (e.g. there is a whole range of subsistence farmers; crop farmers etc.). What is important about this is that this clear differentiation enables a sector to plan and plot clear connections within occupational families; it enables better human resource practices in terms of career pathing and enables collection of coherent labour market information. It also allows for allocation of training funding, and ultimately access to training and expansion of human capabilities.

These disjunctures raise further concerns when viewed on NOPF – the absence of clearly differentiated technical and elementary occupations reflects loose, unfocused occupational progression pathways e.g. Environmental Practices Inspector (skill level 2 occupation) is mapped to Environmental Manager (skill level 5) without any intermediary options, making a system supported viable learning pathway virtually impossible. Unlike the example depicted above from the agriculture sector (and other sectors such as mining, banking and other sectors that propel the capitalist economy), environmental occupations reflect discontinuous pathways. The DEA (2010a) critiqued the system for privileging private sector interests over the public good.

Under neoliberal capitalism and the market, one finds the dominance of labour market perspectives and the ‘language of occupations’. In skills development and planning, this has become the dominant code of meaning. It holds power in that resources, qualifications development and skills planning are centred on the language of occupations. Identifying absences such as those identified above starts to intensify concern around systemic articulation for public good occupations (e.g. some green jobs) within an occupationally driven system of skills development. These appear to be critical to address if meaningful learning pathways as envisaged by the DHET (2012) are to emerge for this new area of economic development and social-ecological practice in South Africa.

- *Qualifications (or the absence thereof)*

Qualifications remain another key leverage point into sector employment and are thus a critical system element of learning pathways. To understand the qualifications landscape, I studied the SAQA qualifications database (as at 20-12-2012). From this analysis, I identified 1 330 environmentally related qualifications. The qualifications crossed a variety of environmental faculties – mining, forestry, agriculture, nature conservation, and environmental science, showing up some aspects of the cross-sectoral nature of environmental education and training provisioning. The data reflected that the NQF level distribution of the registered qualifications is as follows:

[INSERT FIGURE 7.2 HERE]

Figure 7.2: Distribution of environmental qualifications across NQF

The data reflects a sector that has overwhelming access points at NQF levels 7 and 8 indicating that the system appears to be viewing environmental qualifications mainly as a specialization – again reflecting a dominant postgraduate entry-point into the sector (also reflected on the OFO categorization of environmental occupations). This data suggests that learners unable to gain access at level 6 will have limited options for access or for alternate pathways reflected by the poor options at levels 4-5. A learner that is unable to gain access to the traditional academic pathway will struggle to shape an alternative or to navigate into an environmental job. The data clearly depicts how qualifications shape who enters the sector, and where and at what levels. This is an issue of concern, as the DEA (2010a) for example identified up to 30 000 entry level employees working in local government alone. Subsequent empirical research has shown that there are almost no learning pathways available for these workers in the environmental sector (Mohano, 2013), and is also a concern given the status of scarcity of environmental technical occupations noted above.

- *Clear, visible and accessible intermediate skilling pathway options*

The South African Human Resources Review (Human Sciences Research Council [HSRC], 2009) notes that three differing labour market pathways to intermediate skilling have emerged in South Africa: the traditional apprenticeship route, the 'learnerships' pathway, and further education and training (FET) college programmes (Kraak, 2008, p. 479). However ineffective functioning of these pathway options have been recognized by several studies (Kraak, 2008; Perold, Cloete and Papier, 2012). Kraak (2008, p. 479) argues that these three differing pathways for the "production of intermediate skills constitute a highly malfunctioning labour market for technically skilled labour". Graduates of education and training institutions are unable to traverse coherent and visible pathways into intermediate skilled employment (Kraak, 2008). Within this unpromising national scenario the Environmental Sector Skills Plan of South Africa (South Africa. DEA, 2010a) found that only 2.4% of learnerships in South Africa are 'environmental' learnerships. The

Local Government Sector Education and Training Authority's Sector Skills Plan (LGSETA, 2012) reveals that in the 2009-2010 period, 5% of interns used within the constituency were utilized for environmental management purposes across environmental health and pollution control. These findings both suggest that dominant intermediate skilling pathways are underutilized by the environmental sector. The DEA (2010a) attributed this partially to weak Human Capital Development Planning capacity in the sector, and also to the newness of the sector and a lack of systemic coherence in and for skills planning for the sector. Being primarily an empirical study, the Department of Environmental Affairs (2010a) analysis did not consider additional underlying generative mechanisms as proposed to be possible in the retroductive theory presented above.

Implications of this absence for environmental learning pathways

As a sector with a complex multi-disciplinary and multi-sector engagement and transformation agenda, the environmental sector is dependent on enabling multiple entry points into the sector and multiple exit points that can allow learners entry into occupations from various pathways. For this to be realized, it requires occupations that are differentiated and connected to enable progression and movement through an occupational field.

The chapter so far, has tried to illustrate that the absence of clear technical intermediate skill jobs, absence of sound occupational knowledge of these intermediate jobs and labour market information about demand of these jobs constitutes a highly significant 'missing middle' in the skills pyramid of the environmental sector.

This emergent 'missing middle' constitutes a stratum that can enable better learning pathways, and provide articulated access when connecting to artisan occupations. It can also enable movement of entry level skills into intermediate occupations and it can provide the mechanisms to enable parallel pathways. Parallel pathways enable entry via another route (e.g. for a student that does not obtain university entrance) as well as creating the cushion for the student that drops out of traditional 'academic' pathways. A significant observation from analysis is that everything below

professional occupations and jobs are conflated, hence prompting inaccurate and unclear labour market information about the sector, negatively affecting the public good role and possibilities of the environmental sector, affecting access into and building of a more benign, 'greener' economy.

The nature of the missing middle, or this substantive absence, that characterizes the environment sector highlights how intermediate skilled workers face a number of distinctive challenges as it shapes who enters, how they move and how their jobs are conceived. There is a poor conception of work roles, tasks and the scope of jobs can result in underutilization of available skills; and low-skilled workplaces tend to have few career development and progression opportunities, poor human resource practices and higher staff turnover (DEA, 2010a).

Two empirical observations attest to how this absence has shaped the environmental sector:

- Because there are few or no intermediary learning pathways, high skill staff are often underutilized and tend to be in positions that could be filled by technicians (e.g. employing masters graduates and using them in technical roles that could be filled by NDip diplomats). This perpetuates practices of underemployment. This results in graduates moving into other sectors as their skills are undervalued and poorly utilized (Ramsarup, in press)
- A study by Mohanoe (2013) found that the lack of attention given to the learning pathways of local government sustainability practice workers at entry skill occupation level responsible for improving quality of life in urban and rural communities through their sustainable development practices was paradoxically running counter to numerous policy statements. According to the worker's experiences there is no mobility or progression on their learning pathways (Lotz-Sisitka, Mohanoe, Ramsarup and Olvitt, 2012). Such workers, with years of experience in environmental practices, could potentially, with recognition of prior learning and additional training, be offered opportunities to enter the intermediate skills level.

Using the concept of emergence (Bhaskar and Parker, 2010) to interpret this, it is possible to see that on the first, higher order level, a well articulated provisioning system provides the boundary conditions for the lower order or more basic level maintaining the status quo via a lack of access to private and public qualifications and courses in the environmental field. On the second, the lower order or more elementary occupational level, the absence of occupational differentiation provides the boundary conditions of possibility or access into the environmental sector. This affects learning pathways progression, and possibilities for access into the emergent or higher order level. In the case of South Africa, where access to training is determined by occupational differentiation at this level, without occupational differentiation there can be no formally constituted education and training provisioning, a practice that continues to maintain patterns of exclusion from possible learning pathways and jobs. Thus what can be observed is that several distinct mechanisms, at different and potentially emergent levels are combining to produce a unique result (Bhaskar, 2010 p.5), as depicted by the emergence of a high skilled thesis within the environmental sector.

Using an example of engineering provisioning to illustrate options for transformative praxis

A further aspect of the identification of absence, as outlined in the analysis above, is the possibility of understanding what is at 1M, absence at 2E, possibility at 3L and transformative praxis, or that which is possible and can be enacted at 4D of Bhaskar's MELD schema (Bhaskar, 1993). To consider possibilities and potential transformative praxis, I turned to an analysis of the engineering sector, which, unlike the environmental sector described above, has well defined and clearly differentiated occupations, as well as parallel learning pathways. My interest in this learning pathway is also because the occupation of 'environmental engineering' has been identified as a scarce skill in the sector. Besides providing useful insights into why this occupation was defined as 'scarce' in South Africa (Ramsarup, in press), I found that it provided useful transformative praxis insights for the sector as a whole.

Engineering sector: Illustrating transformative praxis

Despite being widely regarded as a high skilled sector, the engineering sector has developed a fairly progressive model of access that embodies multi entry and exit options. In this section I use the pathways framework of the engineering sector to explore Bhaskar's (1993) suggestion that sometimes an absence is present somewhere else. Enabling broad access that caters beyond the 'privileged learner' i.e. the learner that gains access into higher education, is dependent on enabling multiple entry points into the sector and multiple exit points. This allows students entry into occupations from various pathways. It also requires differentiated occupations that are connected to enable progression and movement through an occupational field, as also mentioned above.

The Engineering Council South Africa (ECSA) is the statutory body charged to act in the public interest. The data in the engineering sector provides a stark contrast to the data on environmental learning pathways. Key to this appears to be the presence of a professional association that understands the skills needs of the sector wellⁱⁱ. This is displayed by well quantified, high quality skills intelligence from a demand side perspective and clear occupational differentiation which allows for balance of skills mix in the sector. ECSA is able to define the 'mix' of skills needed to adequately resource the engineering sector as cited by Case (2006):

1 graduate engineer: 1 B.Tech: 4 technicians: 16 artisansⁱⁱⁱ

Data from the engineering sector (retrieved from ECSA – 31 May 2012) reflects a broad range of access points into the engineering sector each with well defined pathways:

Engineering	Qualification route
Engineers	4 year Bachelor of Science: Engineering (B.Sc Eng) / Bachelor of Engineering (B.Eng)
Engineering technologists	Bachelor of Technology (B.Tech)
Engineering technicians	National Diploma (NDip)
Certified engineers/ engineering artisans	Government certificate of competence that enables them to work in mining or a particular engineering industry.

	They are generally artisans who then study at a Further Education and Training (FET, equivalent to Technical and Vocational Education and Training (TVET)) College, and take on industry roles.
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In South Africa, national diplomas are offered across 10 higher education institutions across nine engineering disciplines. The Bachelor of Technology (B.Tech) is offered across 10 higher education institutions across seven engineering disciplines. There are five reflected environmental specialisations at B.Tech, B.Sc, and B.Eng qualifications across 8 institutions across 14 engineering disciplines.

This data reflects an intention to create complementary sectors – with “equal missions but differentiated missions” (Case, 2006). Case (ibid.) reports that in the engineering sector, students that drop out of university engineering degrees can progress very successfully through National Diploma into B.Tech. Engineering reviews have also found this engineering artisans group to have developed high levels of competence – in some instances equivalent to technologists (Hanrahan, 2000). This qualification differentiation clearly gives different access routes and opportunities for ‘second-chance’ pathways and provides recognized mechanisms for learners to change from one learning track to another. This provides a framework that contains ‘bridges and ladders’, that enable young people to move through the system in accordance with their needs (Hoppers, 2009).

The challenge the sector was facing as reported by Case (2006) was that engineering output was equal to output of technicians i.e. *1 engineer: 1 technician*. This resulted in engineers doing work that a technician should have been doing (a problem not different to that identified above in the environmental sector). Consequently, in recent years, an expanded effort has been made to attract and increase artisan and technician practitioners. Case (2006) reports that although B.Sc.Eng numbers have remained fairly steady there has been a significant increase in University of Technology students since the introduction of the B.Tech qualification in 1995. The sector has additionally also introduced strategic interventions that are now strengthening B.Tech programmes to enable crossovers into Masters in Engineering.

Outlining possibilities for transformative praxis

As can be seen from the above, the dialectical critical realist methodology adopted in this study involves identifying 'what is' or 'being' using a depth ontological perspective; it also involves identifying absences, possibilities for transformative praxis, and ethical action (the actualizing of transformative praxis). I have given attention to all of the above in the chapter, except the actualization of transformative praxis. In a chapter like this it is not possible to report on how such transformative praxis will play out; thus the best I can offer is to re-imagine such transformative praxis for the sector. I conclude the chapter with this contribution.

In offering this conclusion, I conclude the dialectical movement that is required from concrete and structured experience of being (e.g. the experience and realities shaping progression in a learning pathway) to the possibility for transformative praxis, or a new way of 'becoming' where such realities can be transformed (I have shown that this is possible by the presence of the absence I have identified somewhere else). This has helped understand how it can be possible to absent the absences through giving attention to systemic elements of learning pathway construction.

Re-imagining transformative pathways for the environmental sector: Absenting the absence of intermediate skills

To absent the absences identified above, I propose the following possible actions through which, I argue, it is possible to re-imagine systemically articulated and transformative learning pathways development possibilities for the environmental sector:

- **Pro-active skills planning from a base of better labour market information:** This analysis has highlighted the absence of a clear understanding of the complex multifaceted nature of the environmental sector and the nature of the different jobs needed across the sector (now and in the future) coupled with an understanding of the system that produces and uses

environmental professionals. The Environmental Sector Skills Plan for South Africa (South Africa. DEA, 2010a) identified the need for better skills information as without this labour market information it is not possible to enable more inclusive skills planning. Having systemic capacity to provide for better labour market information can potentially foster improved understanding of the skills mix (across levels of skills) needed in the sector. This recommendation is strongly supported by the Environmental Sector Skills Plan for South Africa (South Africa. DEA, 2010a). It also supports a social justice argument for greater access into the sector via a range of pathways and chances. Additionally, it also supports a sustainability argument that more people need to be engaged in environmental concerns in order to counter existing hegemonies of resource management and control proposed in my retroductive argument.

This would be inclusive of a more **reflexive and open systems approach** to labour market analysis, as it is understood that the environmental skills needed today may not be the same as those needed in future given the rapidly changing social-ecological context. This may require innovation in labour market intelligence system designs.

- **Skills pyramid resource and job needs of sector:** Better labour market information has potential to enable a better understanding of resource needs across levels of skill – and could enable a better understanding of the nature of our jobs making more explicit what is entailed in jobs, job descriptions, occupational differentiation, scope and level of expected tasks and so on. All of this can enable a better understanding of occupational progression, making learning pathway possibilities more transparent and accessible to learners and workers and managers alike. This understanding of skills mix can potentially also foster better co-ordinated operations across the sector amongst stakeholder groups such as employers, government agencies, professional bodies, and employees.
- **Prioritizing multiple pathways** – In this chapter I have made a strong access

argument for multiple pathways. At the same time the chapter highlights how these pathway links are structured and how they relate to the production of different types of skill which cannot be disconnected in the emergence of a high-skills sector, if wider transformation goals are to be attained. It is interesting that the environmental sector to date has prioritized high level skilling, with very little attention being given to those systems of skills provisioning that are essential for longer term support and expansion of the high skills base for transformation purposes (HR related), but also wider social-ecological transformation objectives and widespread sustainable development which are high on the agenda of the environmental sector. This is perhaps also related to inadequate education and training or human capital development capacity in the country, the newness and rapid growth of the sector, and may also be related to the way in which power over natural resources is structured in society.

- **Pathways with destinations** - As we approach the artisan revolution set to hit South Africa – a multi-pronged approach to skills development with a focus on joined-up processes in the environmental sector is advocated with clearly articulated and programmed attempts to connect low skill programmes to intermediate skills development programmes. The issue “... is not the creation of low-skills work in itself, but how routes out of such work can be created and protected” (Lauder and Brown, as cited in Kraak, 2008). Except for in the waste sub-sector of the wider environmental sector (South Africa. DEA, 2010b) and the Expanded Public Works Programmes (EPWP) programmes, there is very little knowledge on artisan, entry-level occupations, and these too are poorly defined in occupational systems and learning pathways development terms. In any discussion around entry level provisioning, upskilling and routes out of low-skills work, the sector needs to learn from the histories of countries that have faced the problem of a low-skills equilibrium in which institutional barriers trap generations of workers in low-skills work, as has been found to be the case in, for example, local government environmental practitioner employment (Mohano, 2013), due also in part to the problem of wider skills planning neglect as outlined in this chapter and in

the Environmental Sector Skills Plan for South Africa (South Africa. DEA, 2010a).

- **Role of the professional body** – the engineering example has illustrated the role that a professional body can play in enabling transformative potential in a sector – the co-ordinating role can enable the sector to keep their eye on the ‘big picture’ (sector-wide view). The professional body can also play a key role in maintaining synergy between the systems of practice and the systems of provisioning – raise disjuncture, enable bridging when needed to maintain quality and standards and enable a proactive approach to skills planning. Here it should be noted that the new NQF Act no. 67 of 2008 foregrounds and gives new credence to the role of professional bodies in skills planning and development. The sector would need to consider the requirements for establishment and recognition of professional bodies under this act. The professional body, its position and role can become the ‘bridge’ between the ‘different pathways’ enabling better systemic articulation. In this process care should be taken to not only foreground the Green Economy (economic development) aspects of environmental skills and qualifications development, but also the natural resource management and longer term sustainability aspects of environmental skills and qualifications development (i.e. the public good aspects of the sector’s work). A Green Economy Skills Planning Forum has recently been established in South Africa considering the former, while an Environmental Sector Skills Planning Forum also exists (considering mainly the latter). These may need to ‘come together’ for a more co-ordinated approach to environmental sector skills planning in South Africa in future.
- **Role of workplace** – workplaces have a critical role to play in mediating young graduates into the development of professional competency. Enabling progression along pathways especially at low to intermediate skills is very reliant on the workplace and diverse and creative mechanisms for workplace learning and human resource development. The study by Mohanoe (2013) identified that aspects such as power relations and access to power and resources in the workplace, high quality and futures-oriented internal skills

planning and Human Resources Management systems, workplace mentoring systems, and visionary management are critical factors for enabling a workplace where learning pathways are opened up, and not simply left absent or neglected.

- **Focusing on the whole pipeline** – For a mixed skill sector to emerge there is a need to focus on the whole pipeline – starting at schools. Career guidance around non-academic based careers is critical. Generating public knowledge and interest around diversity of technical jobs is also critical, as is a recognition of their importance to society and sustainable development. The attention given to training technicians associated with South Africa's Green Drop programme is perhaps an example of such a process where the technical skills are seen to be highly valuable to society as a whole.

Conclusion:

I have explored connections and disconnections between systems of provisioning (such institutional arrangements) and systems of practice (such as the actual job roles) and have argued that the absence of clear labour market information coupled with institutional and structural constraints, has opposed the emergence of clear occupational differentiation for environmental occupations. This perpetuates ongoing problems of education and training system provisioning for a sector that is struggling to differentiate occupational roles (professional, technical and elementary), and leaves it unable to clearly depict occupational progression and career paths.

This scenario constrains the emergence of a well-articulated provisioning system within the environmental sector as it hinders the emergence of new or parallel learning pathways from technical into professional pathways and by not providing connecting points for artisan pathways. The emerging learning pathway picture is thus one that favours single, traditional academic pathway trajectories constraining broad access, mobility and progression with negative social justice, and social-ecological constellation impacts as outlined above.

Through the critical realist analysis, the chapter provides for transformative praxis possibilities within a systems wide approach to learning pathways development and actualisation. I have discussed a number of key leverages of change above e.g. occupational differentiation; better labour market information; improved skills planning; effective coherent provisioning that can all enable multiple entry multiple exit and support an improved pathways model. The final caveat is related to the nature of social-ecological systems change. It is rapidly advancing, affecting societies and economies everywhere and rapid, yet reflexive engagement with these changes is necessary. Responding within this system with clear social justice objectives is necessary for a view of sustainability that encompasses the flourishing of all, and may also be necessary for shifting the power₂ relations of the elite in managing South Africa's environment and gaining access to green economy opportunities. As shown in this study, an open and emerging system can learn internally from other parts of a system through identifying absences that may be present elsewhere.

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ⁱ It is noted here, that environment and sustainable development is actually cross cutting across various economic and other sectors, but for purposes of understanding the problems related to the emergence of education and training system responses, we use the term 'sector' here.

ⁱⁱ The environmental sector does not have an equivalent professional body. It has a number of affiliated professional bodies that deal with some aspects of the sector's supply and demand issues. This is proving to be inadequate for substantive analysis of supply and demand, and for in-depth knowledge of skills needs and planning.

ⁱⁱⁱ The environmental sector currently has no such understanding of demand.