

Post-industrial urban quarries as places of recreation and the new wilderness – a South African perspective

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Abstract

The objective of this article is threefold: To re-evaluate the concept of wilderness as a place to be experienced by human beings as part of their outdoor recreational needs; to investigate if reclaimed post-industrial urban quarries can fulfil these needs, and to investigate the legislative frameworks in South Africa within which such reclamation and re-use can be undertaken. The objective is not to present detailed case studies of post-industrial urban quarries that have been rehabilitated or redeveloped for a different land use, but rather to demonstrate the potential of such quarries. The majority of South Africa's population is urbanised and has hardly any prospect, due to various constraints, of ever visiting natural or even 'man-made wilderness' areas for recreational purposes. The currently held concept of wilderness is critically evaluated and the need to change our perception of wilderness is discussed. The biophysical and socio-economic nature, as well as the legal framework, within which the redevelopment potential of our ubiquitous post-industrial urban quarries must be viewed, are examined to determine whether they can be reclaimed as outdoor recreation places and a new 'urban wilderness'. It is shown, through a literature review and examining five case studies, that reclaimed quarries can satisfy urban dwellers' innate need for outdoor recreational spaces and natural or wilderness areas, albeit man-made and despite the procedural challenges posed by the requirements of the South African regulatory urban spatial planning frameworks and Acts.

Keywords: Derelict land, legislative frameworks, outdoor recreation, post-industrial urban sites, quarries, wilderness

POSTINDUSTRIËLE STEDELIKE STEENGROEWE AS PLEKKE VAN ONTSPANNING EN DIE NUWE WILDERNIS – 'N SUID-AFRIKAANSE PERSPEKTIEF

Die doel van hierdie artikel is drieledig: Om die konsep van wildernis as 'n plek wat mense kan ervaar as deel van hul buitelig-ontspanningsbehoefte te herevalueer; om te bepaal of herwinde postindustriële stedelike steengroewe aan hierdie behoeftes kan voldoen, en om die wetlike raamwerke waarbinne sodanige herwinning en hergebruik kan plaasvind te ondersoek. Die doel is nie om gedetailleerde gevallestudies van sodanige steengroewe aan te bied nie maar eerder om die potensiaal daarvan aan te toon. Die meerderheid van die Suid-Afrikaanse bevolking is verstedelik en het min vooruitsigte, weens verskeie beperkings, om ooit natuurlike of selfs 'menggemaakte' wildernisgebiede vir ontspanning te besoek. Die huidig-aanvaarde konsep van wildernis word krities geëvalueer en die noodsaaklikheid om ons persepsie van wildernis te verander word bespreek. Die biofisiese en sosio-ekonomiese aard van ons alomteenwoordige postindustriële stedelike steengroewe word ondersoek om te bepaal of hulle herwin kan word as plekke van buiteligontspanning en 'n nuwe 'stedelike wildernis'. Daar word aangetoon, deur middel van 'n literatuuroorsig en vyf gevallestudies, dat herwinde postindustriële stedelike steengroewe wel stedelinge se ingebore behoefte vir buitelig-ontspanningsplekke en natuurlike of wildernisgebiede, alhoewel menggemaak, kan bevredig ten spyte van die prosedurele uitdagings wat deur die vereistes van die Suid-Afrikaanse regulatoriese stedelike beplanningsraamwerke en wette gestel word.

Sleutelwoorde: Buiteligontspanning, postindustriële stedelike terreine, steengroewe, verlate land, wetlike raamwerke, wildernis

DIBAKA TSE BILENG TENG DITOROPONG KA MORA DIINDASTERI JWALOKA DIINDASTERI JWALOKA DIBAKA TSA BOITHABISO LE NAHATHOTE/LEFELLA – PONO YA AFRIKA BORWA

Sepheo sa atikele ena se na le dikarolo tse tharo: Ho hlahloba botjha kgopolo ya nahathote/lefella jwaloka sebaka seo batho ba ka se bonang e le karolo ya ditlhoko tsa bona tsa boithabiso. Ho fuputsa hore na dibaka tse bileng teng ka mora diindasteri di tla kgona ho phethahatsa ditlhoko tsena le ho fuputsa meralo ya molao Afrika Borwa, eo ho yona ho tsosolosa le tshebediso botjha di ka etswang. Sepheo hase ho hlahisa dithuto tsa mehlala (case study) tse nang le dintlha ka dibaka tse bileng teng ka mora diindasteri, tse lokisitsweng kapa tse ntlafaditsweng bakeng sa tshebediso e fapaneng le ya lefatshe, empa e le ho bontsha bokgoni ba dibaka tse kang tseo. Boholo ba baahi ba Afrika Borwa ba phela setoropo, mme ba na le toro/tjhebelopele e nnyane ka lebaka la ditshitiso tse itseng ya ho etela dibaka tsa tlhaho kapa nahathote/lefella le entsweng ke batho bakeng sa mabaka a fapaneng a boithabiso. Kgopolo e teng hajwale ka nahathote/lefella e hlahlojwa ka botebo le tlhoko ya ho fetola kgopolo ya rona ka nahathote/lefella di a sekasekwa. Saense ya tshebediso ya melao ya tlhaho (biophysical) le tsa setjhaba le moruo (socio-economic nature), hammoho le moralo o molaong moo teng kgonahalo ya ntlafatso ya dibaka tsa rona tse bileng teng ka mora diindasteri lefatsheng ka bophara di tlamehile ho bonwa. Di hlahlojwe bakeng sa ho bona hore na di ka kgona ho tsoswa jwaloka dibaka tsa kantle tsa boithabiso le nahathote/lefella la motsetoropo. Ho bontshwa hore, ka tekodisiso ya dingolwa le ho hlahloba dithuto tse hlano tsa mehlala; tse hlahlositseng hore dibaka tsena di kgona ho kgotsofatsa ditlhoko tsa tlhaho tsa baahi ba toropong, tsa dibaka tsa boithabiso tse kantle le dibaka kapa nahathote/lefella la tlhaho; le hoja di entswe ke batho, hape ntle le diphepetso tsa tsamaiso tse tlisitsweng ke diphehelo tsa tsamaiso ya meralo ya tshebetso ya sepakapaka toropong le melao ya Afrika Borwa.

1. INTRODUCTION

The mountains are calling and I must go.

In every walk with nature one receives far more than he seeks.

The clearest way into the Universe is through a forest wilderness.

(John Muir 1838-1914, in Wolfe, 1979: 313).

This yearning by John Muir expresses a wish that is probably not attainable by the majority of urban dwellers who do not have the means to travel to often distant 'natural' nature areas.

Over 63% of South Africa's population is urbanised (RSA, 2011) and a sizeable number of them have no prospect, mainly due to financial constraints, of ever visiting natural or even 'man-made wilderness' areas for recreational purposes. Cronon (1996a: 85) deplores the fact that the so-called 'wilderness experience' is often viewed as a form of recreation enjoyed only by those "...whose class privileges give them the time and resources to leave their jobs behind...".

It is argued that, to fulfil human beings' need for access to wilderness areas for recreational purposes, their perception of what constitutes wilderness must be critically evaluated with the view to accept the new reality of an urbanising world. The need to identify and develop suitable pockets of land in or close to the urban landscape to satisfy this requirement has thus become imperative.

It is also argued that the ubiquitous post-industrial and abandoned quarries in urban areas are well suited to be reclaimed to satisfy the need for a 'new wilderness'. As remnants of once economically viable industrial enterprises, Bartsch and Collaton (cited in Allen, 2012: 157) find that "[v]irtually every city in industrial regions, no matter its size grapples with the challenge of unused manufacturing facilities and other industrial sites". Allen labels these sites post-industrial latent spaces (PILS) and suggests that, in these PILS, a new *urbis incognita*, a hidden, forgotten and ignored wilderness in the city, has emerged

and replaced the virginal wilderness, the previous *terra incognita* (Allen, 2012).

2. THE NEED FOR PARKS, OTHER RECREATIONAL PLACES AND AN URBAN 'WILDERNESS'

The etymology of the term 'park' refers to an enclosed preserve for animals to be hunted. The term 'wilderness' refers to the place where flora and fauna are allowed to run wild (Odhams Dictionary of the English Language, s.a.: 1189). Only much later was the meaning of the term 'park' expanded to include "An ornamental piece of ground enclosed for public or private recreation" (*Odhams Dictionary of the English Language, s.a.: 764*). This is similar to one meaning of the word 'garden', i.e., "serving as a place of rest and recreation" (*Odhams Dictionary of the English Language, s.a.: 471*).

Various authors find that there is an increasing demand for 'green' areas and outdoor amenity spaces in urban centres to provide in the inhabitants' recreational needs and to foster their growing environmental awareness (Allen, 2012; Lisberg Jensen & Oui, 2008; Martin & Berlin, 2012a; Rojek, 2005). In this regard, Damigos and Kaliampakos (2003: 249) suggest that 'green' spaces provide aesthetic, ecological and economic benefits. They also include functions such as air pollution control, noise reduction, improvement of microclimatological conditions and provision of recreational opportunities that have a physical and psychological effect on human health. Authors such as Kellert, Heerwagen and Mador (2008) and Wilson (1984) note their concern that, despite our biophilic nature, the ill-considered exploitation of natural systems that could provide the above benefits continues.

The World Leisure Organization (WLO) builds on Article 27 of the Universal Declaration of Human Rights that holds that all societies recognise the right to rest and leisure. The WLO's Charter (2016) lists eight articles of which one is worth repeating: "Provisions for leisure for

the quality of life are as important as those for health and education. Governments should ensure their citizens a variety of accessible leisure and recreational opportunities of the highest quality".

To what extent can 'nature' be developed or altered without losing those essential characteristics that enable it to meet the needs of urbanites for 'nature' or 'wilderness'? In response to this question by Lisberg Jensen and Oui (2008: 179) and based on research by Berggren-Barring and Grahn in 1995, Swedish landscape architect Stigsdotter has identified eight essential characteristics of 'natural' outdoor recreational spaces that make them popular, appreciated and visited:

- Serenity: where peace and silence can be found
- Wildness: where wild nature seems to have been the forming agent
- A rich biodiversity
- Space: offering a restful feeling of 'entering another world'
- The common: a green, open place providing vistas and inviting the visitor to stay
- A pleasurable garden: an enclosed, safe and secluded place
- Festivity: a meeting place for festivity and socialising
- Culturally rich: a historical place offering fascination with the course of time (Stigsdotter, 2005: 17).

It is suggested that all the above characteristics are able to be reproduced in a man-made 'natural' recreational environment, except the concept of wildness that may require a re-appraisal by many urbanites.

3. THE CONCEPT OF 'WILDERNESS' – HOW THE MEANING HAS CHANGED OVER TIME

The term 'wilderness' was, as recently as the 18th century, used primarily to describe a desolate, barren, deserted place where only wild animals roamed. The term is derived from the old English term *wildæornes* or wild deer (*New Oxford*

Dictionary of English, 2001) and has often been portrayed by painters and writers as a place to be feared, to be exiled to, or, in a figurative sense, referring to a position of disfavour. By the end of the 19th century, this meaning had, however, changed. From John Muir's (Scottish-American naturalist and prominent pioneer of the preservation of wilderness areas in the United States of America) extensive *oeuvre* on the sublime and intrinsic value of the wilderness, a newly found appreciation of wilderness developed. Cronon (1996a: 80) comments that the belief at the time was that "[w]ilderness is the natural, unfallen antithesis of an unnatural civilization that has lost its soul. It is a place of freedom in which we can recover the true selves we have lost to the corrupting influences of our artificial lives". The paradox arising from this paradigm is that, if we believe that nature, in order to be true, must also be wild, then questions our presence in nature: "... our very presence in nature represents its fall. The place where we are is the place where nature is not" (Cronon, 1996a: 80-81). He then finds that "...by definition wilderness can offer no solution to the environmental and other problems that confront us" (Cronon, 1996a: 81).

Cronon (1996a: 85) suggests that we tend to idealise only a distant wilderness, *i.e.*, 'unspoilt' rain forests, mountains, and canyons, instead of the environment in which we actually live and which, in any event, is the place where most of our environmental problems start and where an environmental ethic about *using* nature sustainably more than *not using* nature is required. He makes a further valid point (Cronon, 1996a: 85) by finding that this wilderness dualism tends to label any use of the wilderness as 'abuse', thus denying us a middle ground where responsible use and non-use could attain a sustainable relationship with nature. Our often dismissive and even contemptuous description of 'nature in urban places' that does not fit the mould of nature in the 'distant wilderness' causes us not to appreciate the potential of places such as post-industrial quarries in our

urban environments to become the new 'wilderness' (Cronon, 1996a: 86).

Various authors have expounded on the need of urbanites to have access to wilderness areas for recreational and other purposes (Jordan, 1994; Lisberg Jensen & Ovi, 2008; Stigsdotter, 2005). As 'untainted' wilderness or 'natural' nature areas become ever more scarcer in an urbanising world, a repositioning in terms of what we perceive as 'wilderness' has become necessary. Although the thought may seem a "heretical claim to many environmentalists, since the idea of wilderness has for decades been a fundamental tenet – indeed, a passion – of the environmental movement..." (Cronon, 1996a: 69), he suggests that the time has come to rethink the meaning of 'wilderness'.

Instead of attempting to divide constructs such as wilderness into dichotomies, *i.e.*, pristine versus transformed by human beings, Gustafson (2000: 646) argues that the remainder, which cannot be reduced to these opposing positions, may present a new approach. The remainder, in this instance, consists of a nature no longer pristine and already reshaped, but which could be reclaimed to become a new wilderness, evolving and starting a new phase in nature's life cycle.

Cronon (1996a: 69) questions the notion of 'wilderness' being the only places on earth not 'tainted' by urban-industrial modernity – "...a refuge we must somehow recover if we hope to save the planet". Instead, he argues that "...far from being the one place on earth that stands apart from humanity, it [wilderness] is quite profoundly a human creation – indeed, the creation of very particular human cultures at very particular moments in human history". He points out that we are mistaken if "...we suppose that wilderness can be the solution to our culture's problematic relationships with the non-human world" (Cronon, 1996a: 70).

The very idea of 'reinventing' nature is without doubt offensive to many people because nature is so closely related to their deepest, individual,

social, and national values (Olwig, 1996: 379). He points out though that, if people are to acknowledge the "...questionable ways their concepts of nature can affect the way they act upon their physical environment, then they must question these values. They must realise that the 'natural' values they find in their environment are given not by physical nature but by society (Olwig, 1996: 379).

Many authors have even begun to question the ideology of landscape preservation; this is based on Baldwin, De Luce and Pletsch's (1994) observation of how much of nature has been transformed in our lifetime:

...we are learning how nature had already been reshaped by our species in the past; and we are realizing that there is not much left to preserve in its pristine state anyway. Furthermore, we are less and less clear about what it would mean to preserve nature... In the best of circumstances, preservation is applicable only to the limited portion of earth that has not already been tampered with (Baldwin *et al.*, 1994: 5).

A new 'nature' and 'wilderness' has to be found; searching only in places deemed 'unspoilt' by man will be fruitless; redefining the concept of 'wilderness' will allow us to find it in abandoned urban, or post-industrial sites such as quarries.

4. HOW POST-INDUSTRIAL URBAN SITES CAN FULFIL THE NEED OF URBANITES FOR A 'WILDERNESS' ENVIRONMENT

The issue now confronting us is the realisation that post-industrial urban sites, such as quarries, often functionally cut off, but geographically located within current urban boundaries, could and should be reclaimed. This realisation supports Bradshaw and Chadwick's (1980: x) contention that we can no longer afford to think of land as a resource to be used once and only for a single purpose. Bradshaw and Chadwick (1980: 282-283) argue that

[t]he wasteful acquisitive behaviour of Western civilisation as it spread through the world has become legendary... We still

believe we can move on from one resource to another as each is used up: and we are prepared even, as in many mining operations, to destroy one resource - the land - in order to get to another - the buried minerals. If the halcyon days are over, then our response has been to rediscover the principle of conservation and the recycling of land.

Krinke (2001: 125) argues that, although many abandoned post-industrial sites may suffer from various forms of contamination and degradation, their location, often within cities, makes them too valuable to ignore. She further contends (Krinke, 2001: 125) that, since Western nations industrialised earlier and more relentlessly, their need to rehabilitate post-industrial sites may be more pressing than in the rest of the world. South Africa is probably at the developmental stage where the rehabilitation and redevelopment of abandoned post-industrial sites is becoming economically feasible and environmentally imperative.

The term 'inventionist ecology', advocated by Turner (1994: 360), suggests that, in addition to the advantages and benefits of conserving natural resources, preserving natural ecosystems and restoring natural landscapes, it should be both possible and desirable when the occasion warrants to create new ecosystems and new landscapes. Both Turner (1994) and Jordan (1994) argue that the mere preservation of what is left of untouched nature will neither rescue nature nor secure a future for humanity on earth. They suggest that, in many instances, the philosophy of preservation does, in fact, inhibit us to respond effectively to some of the ecological crises we now face.

The designs of Frederick Law Olmsted of the Boston Fens and Riverway and New York's Central Park were pivotal in setting the tone of shaping America's landscape from polluted and derelict sections of cities back to nature. Whiston Spirne (1996: 91) argues that "[t]oday the works of the profession of landscape architecture are often not 'seen', not understood as having been designed

and deliberately constructed...many landmarks of landscape architecture are assumed to be works of nature or felicitous, serendipitous products of nature".

The post-industrial urban sites of abandoned steelworks, gasworks, landfills, quarries or polluted riverfronts, generally described as brownfield sites, have now become our cities' parks. Some notable examples include the Gas Works Park in Seattle (designed by Richard Haag Associates, 1971-1975); the Duisberg-Nord Landscape Park at the former Thyssen Steelworks in Germany (designed by Latz+Partner, 1990-2002), and the Parc des Buttes-Chaumont (designed by J.C. Alphand, 1860) in Paris which used to be a quarry and later used as a waste dump site and for mass burials. Other, more recent examples include the Fresh Kills Lifescape Park in New York (designed by James Corner of Field Operations, 2007) on one of New York's largest closed landfill sites and the Sallie Buffalo Park in Ohio which was reclaimed from abandoned coal strip-mining and turned into 170ha of lakes, forests and other recreational opportunities.

A cursory survey, using Google Earth™ (2018), indicates numerous stone, gravel and clay quarries in and around the City of Tshwane. Most of these are still in use, but from their topographical location, it is argued that, in the majority of instances, there will be insufficient fill material to rehabilitate the mining works. The stone quarries' locations, mostly on the city's protected natural ridges, will probably also motivate their future redevelopment as protected natural or wilderness areas rather than any commercial land use. On the Magaliesberg and Daspoort ridges alone, there are probably 12 potential sites; in the Centurion and Midrand areas, there are at least five stone quarries, and in lower lying areas there are at least eight clay and sand quarries, some already flooded.

With reference to Peter Latz's Duisburg-Nord Landscape Park, Terra-toxic (2001: 163) finds that

Latz used the ecological restoration processes as a means and motive for the re-development of the abandoned steelworks to a community landscaped park, but stresses that the process should be viewed as on-going, evolving as site conditions change and that Latz perceives himself as only the facilitator of such changes. This approach of re-adaptation, preservation of historical artefacts and on-site treatment of pollution presents a new paradigm for the traditional concept of a park (Terra-toxic, 2001: 163).

Entropy, the "process of degradation or running down or a trend to disorder" (*Merriam Webster Dictionary*, 2015a), of post-industrial urban quarries, previously a source of construction material, has led to a condition that is now no longer appropriate or sustainable. A new role for post-industrial quarries has to be found.

The inherent energy in the processes that led to the termination of quarrying can now hold the potential for a new lease of life. Reclamation plans for post-industrial quarries, which require the landscape to be returned to its original state, are often impractical when one considers the amount of material required to fill a quarry such as the Bingham Quarry in Utah which is 1.6km deep and 4.8km across. While not disputing the value and purpose of reclaiming abandoned quarries to some natural state, it should be recognised that some quarries, specifically those surrounded by urban conditions, now offer the opportunity for bringing a new value and use to these degraded lands.

5. THE BIOPHYSICAL AND SOCIO-ECONOMIC ASPECTS OF POST-INDUSTRIAL URBAN QUARRIES AND THEIR POTENTIAL TO BE RECLAIMED

Post-industrial and now derelict land can be described as having been so damaged by industrial activities that it now requires remediation and rehabilitation before it can become

suitable for new land uses or a second life. This requirement often results in a pejorative view of the potential for re-use of abandoned quarries. It should be viewed against urbanites' need for recreational areas and the 'wilderness' and even more so in South Africa where the majority of its citizens are unlikely to afford access to wilderness areas for recreational purposes.

Lisberg Jensen and Oui (2008: 171) argue that, in the early industrial era, quarries were often enclaves of industrial land in a rural setting, whereas in the post-industrial era, these turned into urban wastelands, open for nature to recolonise. This type of landscape is difficult to categorise, being an 'in-between-land', neither nature nor culture, perceived as ephemeral and inferior.

Quarries were originally mostly established as close as possible to their markets in urban areas, in order to minimise the transport costs of the raw materials that, despite their bulky nature, are of relatively low unit value. At the same time, they were established far enough away from the then urban areas to reduce potential land-use conflict where opposition to extractive operations would be intense (Bauer & Ford, 2014; Dal Sasso, Ottolino & Caliandro, 2012; Fulton, 1989). However, as urban sprawl encircles quarries, their proximity to populated areas leads them to now be considered urban land uses. Consequently, the mining permit holders or the landowners have to confront challenging land-use, environmental, aesthetic and community relations issues; these factors sometimes result in the unplanned and often premature abandonment of the quarry (Bauer & Ford, 2014).

Quarrying disturbs the land and, in the process, affects the balance of the environment's natural systems, e.g., land forms are altered, drainage patterns are disrupted, soil systems are destroyed, and habitats removed (Fulton, 1989). Quarrying also upsets the landscape's cultural balance: "...the land's aesthetic value is changed and continual or multifunctional land-use is placed under risk" (Fulton, 1989: 4).

The potential of post-industrial quarries for reclamation is determined by many factors, of which perhaps the most important are the physical properties of the quarry, its size, depth, the slope and stability of the excavated sides and its relation to the water table. With South Africa's semi-arid climate in most parts of the country, the relation of the excavation depth to the water table or the position of the quarry relative to surrounding water courses becomes important considerations when assessing the potential of a post-industrial urban quarry to offer water-related recreational or 'natural' amenities. Where the mined deposits occur above the water table, such quarries remain dry, unless flooded by surface water run-off. Quarries in low-lying areas are often mined to a depth below the water table and, once activities cease, they rapidly fill with groundwater; sometimes a constraint, but more often an immense opportunity in South African urban areas where natural open water bodies for recreational purposes are scarce. The need for water-based recreational facilities is well appreciated when one considers the popularity of resorts and similar developments along the shoreline of all major dams.

Aggregate mining operations can be categorised as follows: unconsolidated sand and gravel extracted from 'pits', and hard rock materials such as granite and quartzite mined from quarries (Bauer & Ford, 2014: 147). For the purpose of this article, they are used synonymously.

Another problem with apparently abandoned quarries is that the landowners sometimes turn their sites into dump sites, charging for rubbish loads dumped there. Even though this practice is deemed illegal in terms of Section 26 of the NEMA Waste Act (RSA, 2009), it often results in extended periods during which the dump site becomes increasingly unsightly and even more of a problem than when it was used for quarrying.

Another major constraint with the reclamation of abandoned quarries

to their previous natural states or recycled to agricultural productive land is the lack of the vitally important biologically active topsoil overburden that was removed to expose the minerals during the era in which environmental awareness was not an imperative. It is suggested, in this instance, that South Africa's landscape is littered with abandoned post-industrial quarries where suitable fill, particularly topsoil, is no longer available for rehabilitation.

Allen (2012: 158, 159) argues that PILS, which he describes as ecological havens within cities, have an embedded contextual relation to the cities they helped spawn and that such PILS can reignite the interface of the post-industrial site to the city to impart a dynamic social condition in a formerly static space. Although often polluted, PILS nevertheless display an unexpected ecological richness and species diversity. The ecological system that re-emerges will, however, most probably not be the same as that of its pre-industrial state. Non-native species, often invasive, recolonise the sites, which rarely return to an original state. Despite this nascent ecological system, a reclaimed and appropriately revegetated quarry could well be the only remaining ecological conservation option. In this regard, Tropek, Kadlec, Karesova, Spitzer, Kocarek, Malenovsky, Banar, Tuf, Hejda and Konvicka (2010) find that, in the Czech Republic, the current view among ecologists and conservationists is that appropriate reclamation, using spontaneous floral succession, could turn abandoned urban quarries into biodiversity-rich wilderness refuges. Whether they should be reclaimed as nature reserves or urban public parks will depend on the needs in a specific environment.

When considering the reclamation of a post-industrial urban quarry, a clear understanding of the various terms used in this regard is required. Terms often used for land that has been damaged by industrial processes include *brownfield*, *derelict*, *disturbed*, *degraded*, or *spoiled*. Terms often used when describing rehabilitation and renewal processes include

restoration, redemption, reclamation, reuse, or preparing for a second life. These terms are often used interchangeably, although strictly speaking *reclamation* and *renewal* refer to a new land use; *rehabilitation* often refers to visual improvements, and *restoration* is used where the land is to be returned to its former use. For the purposes of this article, the terms *rehabilitation*, defined as "...to restore to a former state, or to bring to a condition of health or useful and constructive activity" (*Merriam Webster Dictionary*, 2015b) and *reclamation*, defined as "...to make (land) available for use by changing its condition" (*Merriam Webster Dictionary*, 2015c) are deemed more appropriate and thus used to refer to all activities contemplated to bring new life to post-industrial urban quarries.

Post-industrial stone and gravel quarries offer other ecological and educational opportunities: deep excavated quarries, where vertical excavated rock walls occur, could be used to display the actual geology of the area. Quarries can form an important component of botanical gardens: the excavated rock faces of quarries could serve as a realistic habitat for cremnohytic plants (vertical cliff face-dwelling plants), since the construction of artificial vertical rock faces as habitat for such rock-hugging plants is difficult where the natural topography of the site does not allow this. The rock garden section of the Royal Botanical Gardens near Hamilton, Ontario, Canada, was established in a reclaimed gravel quarry.

6. POST-INDUSTRIAL QUARRIES AS HERITAGE SITES AND THE NIZHNY TAGIL INTERNATIONAL CHARTER ON INDUSTRIAL HERITAGE CONSERVATION

6.1 Post-industrial quarries as heritage sites

Post-industrial quarries constitute a part of our built environment heritage. The minerals that were extracted from these sites (clay for bricks, and sand and stone for concrete)

are essential materials used in our built heritage.

In addition to structures, buildings and equipment, the South African National Heritage Resources Act (Act 25 of 1999) (RSA, 1999) also classifies cultural landscapes (therefore also post-industrial quarries) of 60 years and older as heritage resources and requires of landowners or developers to obtain a permit from the relevant heritage resources authorities before any alterations or demolitions may be undertaken.

6.2 The Nizhny Tagil International Charter on industrial heritage conservation

In order to give guidance in dealing with post-industrial heritage sites, the Nizhny Tagil Charter was adopted as the international standard for the study, documentation, conservation and interpretation of industrial heritage by The International Committee for the Conservation of the Industrial Heritage (TICCIH) under the banner of the International Council on Monuments and Sites (ICOMOS) in Nizhny Tagil, Russia, in 2003. The following sections taken from the Charter give an indication of what constitutes industrial heritage and under what conditions should conservation, adaptation and re-use of a post-industrial site, specifically with regard to post-industrial quarry sites, be considered.

6.2.1 Definition of industrial heritage

Industrial heritage consists of the remains of industrial culture which are of historical, technological, social, architectural or scientific value. These remains consist of buildings and machinery, workshops, mills and factories, **mines and sites** [author's bold text] for processing and refining.

4.iii. ... Sympathetic adaptation and re-use may be an appropriate and a cost-effective way of ensuring the survival of industrial buildings, and should be encouraged by appropriate legal controls, technical advice, tax incentives and grants [author's note: It is assumed here that, as per the previous definition

of industrial heritage, mines and sites can be included] (Douet, 2013: 236).

Cossons concludes by finding that

[t]he industrial landscape is a misunderstood heritage: at worst, an urban rustbelt, dangerous, a toxic wilderness; at best, an outstanding historical resource to be re-used, regenerating communities, offering real richness and opportunity, reinforcing cultural identity and creating new commercial prospects (Cossons, 2013: 14).

It is suggested, in this instance, that post-industrial urban quarries can be regenerated to create a new urban wilderness.

7. SOUTH AFRICAN LEGISLATION ON POST-INDUSTRIAL URBAN QUARRY REHABILITATION AND REDEVELOPMENT

In the preamble to the Spatial Planning and Land Use Management Act (SPLUMA) (Act 16 of 2013) (RSA, 2013), the following extracts confirm the wide array of legislation pertaining to land-use development in South Africa and with the associated frustrations and attempts to regulate land-use:

...various laws governing land use give rise to uncertainty about the status of municipal spatial planning and land use management systems and procedures and frustrates the achievement of cooperative governance and the promotion of public interest (RSA, 2013: 2).

and

...sustainable development of land requires the integration of social, economic and environmental considerations in both forward planning and ongoing land use management to ensure that development of land serves present and future generations (RSA, 2013: 4).

The objectives of the SPLUMA, therefore, focus on the sustainable and efficient use of land; it gives principles whereby proposed land development is optimised by the use of existing resources and infrastructure.

Fuggle and Rabie (1983: 472, 477) already found in 1983 that, whereas South African environmental land-use planning and control legislation make provision for the establishment of areas that are set aside for a specific form of land use such as nature reserves, compliance with a host of other Acts, ordinances and by-laws at national, provincial or local level is still required. At a local level and in an urban context, complying with ordinances, Town Planning Schemes, Spatial Development Frameworks (SDFs), Integrated Development Plans (IDPs) and by-laws is required to redevelop post-industrial quarries zoned for mining to natural areas, wilderness areas, open space and private or public nature reserves. Sections 12 to 22 of the SPLUMA (RSA, 2013) on SDFs, however, deal with those spatial planning components that require of national, provincial and local government to reach agreement on and to synchronise SDFs accordingly.

National Acts that have a pertinent effect on the change in land use include the National Environmental Management Act (NEMA)(Act 107 of 1998, as amended) (RSA, 1998b); the South African National Heritage Resources Act (SAHRA) (Act 25 of 1999) (RSA, 1999); the Local Government: Municipal Systems Act (LGMSA) (Act 32 of 2000) (RSA, 2000); the Mineral and Petroleum Resources Development Act (MPRDA) (Act 28 of 2002, as amended by Act 49 of 2008) (RSA, 2002; RSA 2008b); the National Environmental Management: Waste Act (NEMWA) (Act 59 of 2008) (RSA, 2009), and the Spatial Planning and Land Use Management Act (SPLUMA) (Act 16 of 2013) (RSA, 2013).

Of these Acts, the MPRDA is the only one that addresses the reclamation or the 'second life' of quarries. Whereas the type of land use for a rehabilitated quarry is not spelled out, it is assumed that, after satisfying the rehabilitation and mine closure requirements by the mineral rights or mining permit holder "... or previous holder of an old order right or previous owner of the works" (RSA, 2008b), the landowner could,

in terms of the relevant authorities' ordinances or a local council's SDF, apply for the rezoning of the land in question to a nature reserve, a private nature reserve, or a wilderness area.

The SPLUMA's objective is to devolve the authority for determining land use to local councils and for them to enact their own by-laws, the underlying purpose being to vest land-use rights with local councils in the first instance (Dacomb, 2017: personal communication).

Local councils' current SDFs and IDPs however, do not envisage the second life of post-industrial sites' land use and, as a result, rezoning applications will have to be made. It is, however, suggested that, based on the desirability of nature and wilderness areas in an urban context and the proven potential of post-industrial urban quarries to satisfy this need, any such application could be well motivated and should be favourably considered by a local authority. This view is shared by Coetzee (2017), but with the provisos that such rezoning applications must not be in conflict with existing surrounding land uses as may be determined by an Environmental Impact Assessment required in terms of Sections 24(2) and 24D of NEMA (RSA, 1998b) and of the MPRDA, and that such envisaged changes in land use comply with the principles contained in Chapter 4 of the SPLUMA.

Dacomb (2017) confirms that, in the City of Tshwane, by-laws regarding mining rights allow mining to be undertaken on a portion of a land parcel, whilst still zoned farmland, for the designated lifetime of the mining activity, after which new land uses will be subject to a rezoning application.

Proclamation of wilderness areas is, however, made by the Minister of Environment Affairs on the recommendation by the South African Heritage Resources Agency (SAHRA) as delegated to the provincial heritage resources authorities in terms of Section 58 of the South African National Heritage Resources Act (Act 25 of 1999).

In terms of Chapter 4 Clause 12(1)(n) of the SPLUMA, which requires local authorities to prepare SDFs, as well as Chapter 4 Clause 21(j) (RSA, 2013), which states that such SDFs should "include a strategic assessment of the environmental pressures and opportunities within the municipal area...", it is suggested in this article that rehabilitated and redeveloped post-industrial urban quarries to 'wilderness' areas present an opportunity for a more environmentally friendly and sustainable second life land use. Clause 28(1) of Chapter 5 of the SPLUMA (RSA, 2013) does, in fact, mandate municipalities to amend their SDFs and resultant Town Planning Schemes by rezoning any land, in order to achieve the goals of their SDFs.

There are currently various legislative requirements for South African mining and environmental rehabilitation. In this regard, Section 38(1)(d) of the MPRDA (RSA, 2002), under the heading *Integrated environmental management and responsibility to remedy*, states that

The holder of a reconnaissance permission, prospecting right, mining right, mining permit or retention permit... must as far as it is reasonably practicable, rehabilitate the environment affected by the prospecting or mining operations to its natural or predetermined state **or to a land use which conforms to the generally accepted principle of sustainable development** (author's bold text).

It should, however, be noted that, in order to minimize the potential environmental impacts of mine closure and rehabilitation, planning for closure should bear in mind possible new future land uses, and approval by all responsible Departments should be obtained.

It is believed that the highlighted text above aligns, to a large extent, the rehabilitation and re-use of post-industrial urban quarries with the goals of the SPLUMA and associated local SDFs. However, in terms of the Heritage Resources Act (Act 25 of 1999) (RSA, 1999), which classifies a post-industrial quarry (a cultural artefact) older than 60 years as a heritage resource, any proposed

alterations still require heritage-related permission before any work on the quarry can be undertaken.

In terms of funding any required rehabilitation or reclamation, financial provision for the remediation of environmental damage is made under Section 41(1) of the MPRDA (RSA, 2002):

An applicant for a prospecting right, mining right or mining permit must, before the Minister approves the environmental management plan or environmental management programme in terms of section 39(4), make the prescribed financial provision for the rehabilitation or management of negative environmental impacts.

Similar requirements for funding rehabilitation are stated under Clauses 24P(1) and (10) of Chapter 5 of the NEMA (RSA, 1998b).

It is argued, in this instance, that, if proper forward planning to remediate the environmental impacts of the mine after closure is made in the mining permit application, and this includes the establishment of a future natural or wilderness area, the relevant approving authorities could prescribe that the financial provisions be utilised to enable such a second life for the mine.

It should also be noted that, in order to transform derelict land (e.g., abandoned post-industrial urban quarries) and land previously used for mining to, among others, recreational use, is deemed to be a listed activity in terms of the amended lists contained in Regulation R660 (RSA, 2008a), Regulation R546 (RSA, 2010) and Regulations R982 to R985 (RSA, 2014) issued in terms of Sections 24(2)(a) and (d) and Section 24D of the NEMA (RSA, 1998b). This activity, therefore, also requires environmental authorisation from the Department of Environment Affairs.

NEMWA's Chapter 4 Part 8 (as amended by the Waste Amendment Act 14 of 2013 and the Waste Amendment Act 26 of 2014) (RSA, 2013) deals with the decommissioning and remediation of contaminated land that indirectly affects or may affect the quality of soil

or the environment adversely. Except for the washing tailings of mined sand and rock that may be considered soil contamination, it is debatable whether quarrying for rock, sand or clay constitutes contamination in terms of the Act's definition. It is suggested, in this article, that this will have to be determined on a case-by-case basis by a competent person such as a pedologist, geologist, geo-hydrologist, or ecologist.

Various authors have commented on the fact that, despite the comprehensive current South African legal requirements, earlier legislation on mining of minerals contained insufficient provisions on the environmental protection and rehabilitation of mining sites, until the enactment of the Minerals Act 50 of 1991 (Humby, 2015; Pienaar, 2013; Swart, 2003). Prior to this, mining licence holders were not required to prepare and submit any form of environmental management programme for the operational and closure phases of the mine. Mining licence holders or landowners often left their abandoned mining areas unrehabilitated after mining ceased. This lack of enforcing legislation has led to a large number of abandoned post-industrial quarries within South African urban areas. In these instances, and where the landowner cannot be held liable, alternative funding models will have to be found to enable rehabilitation and reclamation, since it is likely that the establishment and operational costs of new urban 'wilderness' areas at post-industrial quarries will not be able to be sufficiently funded by charging entrance and use fees.

In cases where the post-industrial quarry holds a substantial and sustainable body of water, the statutory body *Institutional Oversight*, which is the custodian for water management and water services institutions, established in terms of the National Water Act (Act 36 of 1998) (NWA) (RSA, 1998a), could be approached for funding assistance under Section 61: *Financial assistance by the minister*. Similarly, financial assistance can be applied for under Sections 64 and 65 of the Water Services Act (Act 108 of 1997)

(RSA, 1997). In terms of the NWA, the *Institutional Oversight* has to ensure, among others, an enabling environment for the establishment, development and financing of local and regional institutions for water resources management.

8. CASE STUDIES OF RECLAIMED POST-INDUSTRIAL URBAN QUARRIES

Post-industrial urban quarries have historically been reclaimed in many countries. Martin and Berlin (2012b: 20) find that "[q]uarries are everywhere. The construction industry's insatiable need for sand, gravel, and stone for roads, buildings, and landscaping keeps the extraction industry constantly digging holes in the ground and taking huge bites out of hillsides from coast to coast". They quote numerous examples, mostly in the United States of America, of reclaimed quarries that have been repurposed to parks, recreation areas, dams, zoos, and shopping centres:

- Centennial Beach in Naperville, Illinois, consists of a pool with a sandy beach that has been the community swimming hole for over 80 years.
- The historic Quincy quarries near Boston, Massachusetts.
- The sand and gravel quarry in the City of Crystal Lake, Illinois, was reclaimed to host the city-owned Three Oaks Recreational Area, a 66ha public recreation area, popular for swimming and fishing.
- The 445ha Independence Grove in Libertyville, Illinois, which, until 1999, was an active sand and gravel quarry.
- Various reclaimed limestone quarries in San Antonio, Texas, have now become multi-use developments, including two golf courses, a Six-Flags theme park, two large shopping centres, the San Antonio Zoo, and the city's Japanese Botanic Gardens.
- Named by Planning Magazine as one of the 10 Great Places in America for 2011, Des Moines' 68ha Gray's Lake Park, once the site of a gravel and sand quarry, is one of the city's most popular recreation areas.

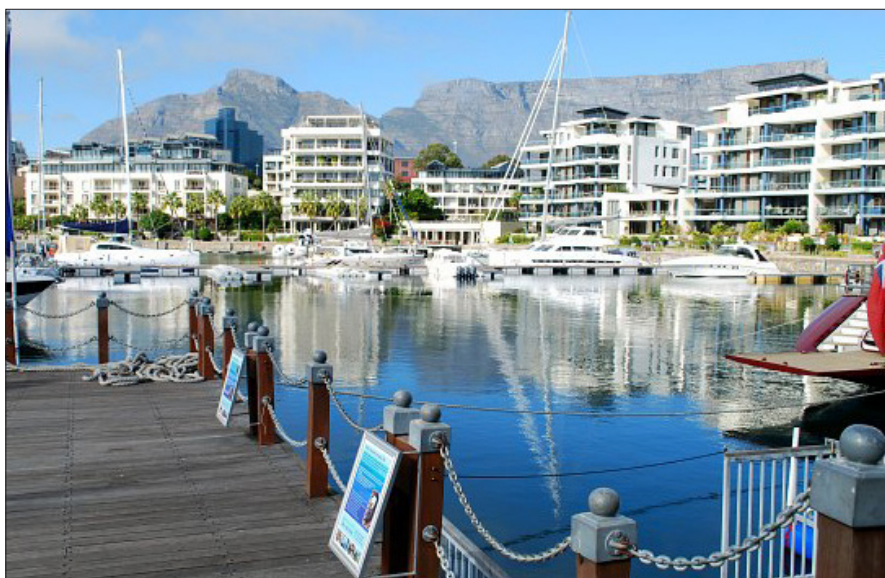


Figure 1: Cape Town residential waterfront development in a former quarry and later a fuel farm

Source: Free Cities Guide, 2018: online

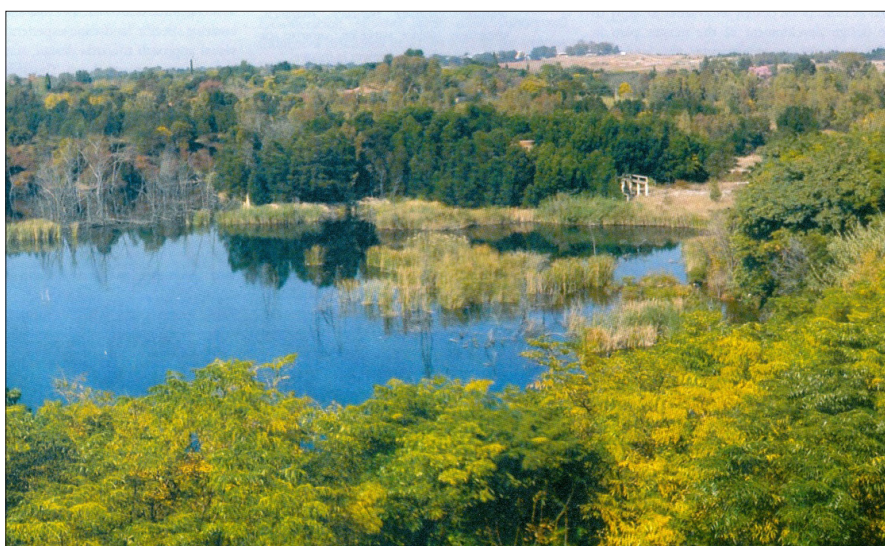


Figure 2: View over the post-industrial Rosema and Klaver quarry in Monument Park, City of Tshwane

Source: Labuschagne, 2013: 57

- The Chambers Creek reclaimed gravel quarry near Tacoma, Washington, has been redeveloped into the Chambers Bay Golf course (site of the 2015 US Open) and boasts two public parks and interconnecting trails.

Five additional case studies, two in South Africa and three in Curitiba, Brazil, are examined in more detail to determine whether post-industrial urban quarries can satisfy the need of urbanites for places of outdoor recreation and even a new urban wilderness.

In South Africa, the case study that is probably the best known is the residential and recreational marina development in the reclaimed stone quarry at the Cape Town Waterfront. Excavated for rock to build the harbour's docks and breakwater from the late 19th century and then used as a fuel tank farm since 1914 (Birkby, 1998), it was rehabilitated in the late 1980s and flooded in 1995 to make way for high-end residential marina and hotel developments (see Figure 1).

Except for the Cape Town example, which focuses on residential and water-related outdoor recreation uses, there has to date not been any recreational parks or wilderness areas established on the sites of post-industrial urban quarries. In South Africa, the trend to date is to rather only use land zoned during the town planning phase for parks as such. Some research proposals have, however, highlighted the possibility of reclaiming post-industrial quarries for outdoor recreation. For example, the proposals for the 50ha Rosema and Klaver quarry site in Monument Park, City of Tshwane, South Africa, are shown in Figures 2, 3 and 4. Rosema and Klaver was a clay brick manufacturing company that started production in 1942 and ceased activities in 1993, due to pending lawsuits from neighbouring residents who were complaining about environmental issues such as noise, dust and smoke from the kilns (Rosema Era Company Archives, in Labuschagne, 2013: 41). Since 1993, the abandoned site has seen the establishment of new vegetation, albeit mostly invasive alien species, and the filling of the excavations with groundwater and, as can be seen from Figure 2, a new 'man-made wilderness' has emerged.

Büchner's proposals (illustrated in Figure 4 and cited in Labuschagne, 2013: 72) point to the Rosema and Klaver quarry's latent potential to impart social (recreational) and ecological resilience to the City of Tshwane.

It is notable that, in the Brazilian city of Curitiba, three of the five major urban parks presented were developed in reclaimed post-industrial quarries during the term of the then mayor Jaime Lerner, an architect and urban designer who is well known for the host of social, ecological, and urban reforms implemented during his terms. The examples discussed, in this instance, resulted from the city's acquisition of the privately owned city's floodplains and disused quarries and then developing these into mostly 'natural' parks, resulting in Curitiba now ranking among the world leaders in per-capita park area (Welle, 2009: online).

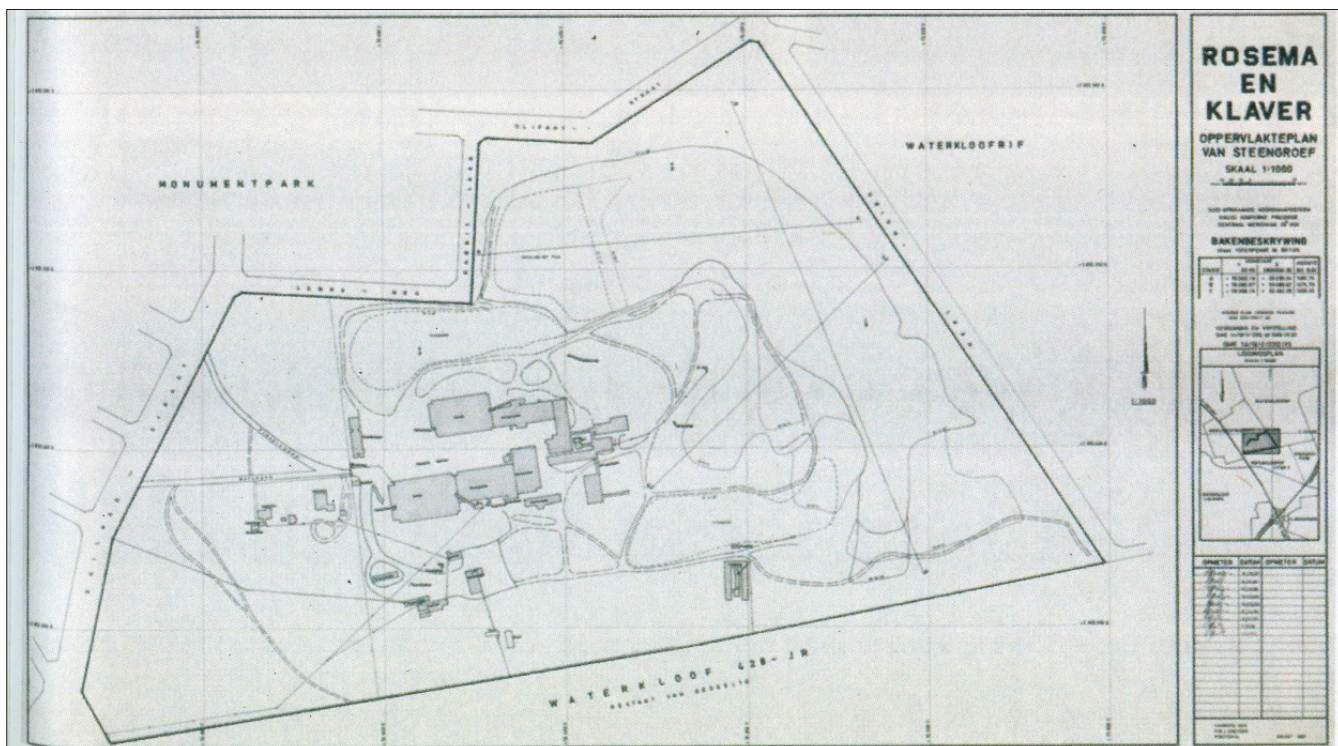


Figure 3: Site plan of the original Rosema Klaver clay brick quarry in Monument Park, City of Tshwane
 Source: Rosema Era Company Archives in Labuschagne, 2013: 39



Figure 4: Proposals for the redevelopment of the Rosema and Klaver quarry in Monument Park, City of Tshwane
 Source: Labuschagne, 2013: 72

8.1 Bosque Zaninelli

This former stone quarry was declared a forest reserve in 1992 and also houses the *Unilivre* (the Free University of the Environment). Apart from the *Unilivre* buildings (built from sustainable materials, mainly timber), the natural environment has been encouraged to re-establish in the reserve, now offering pathways, an ephemeral waterfall and a stream that drains the water collecting in the pond at the bottom of the original quarry excavations (see Figures 5 and 6).



Figure 5: View onto the lake at the Bosque Zaninelli, Curitiba, Brazil
Source: Image by author

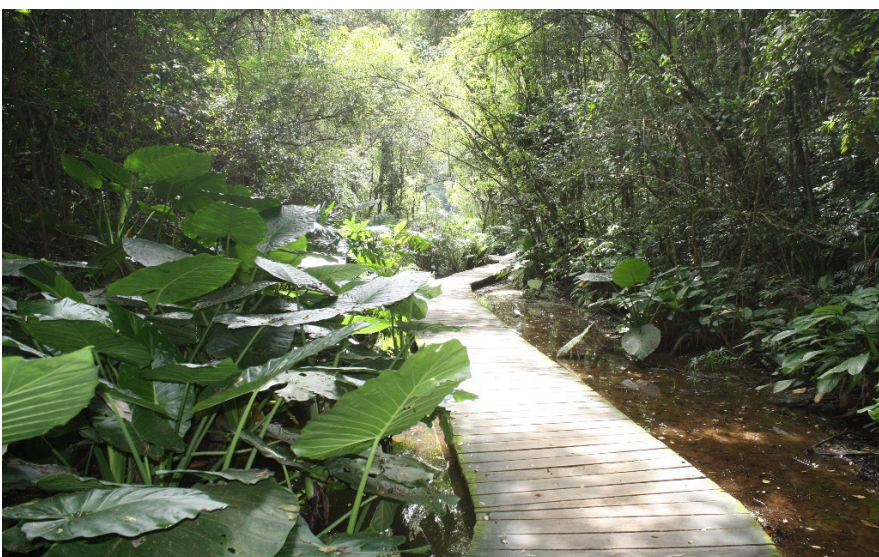


Figure 6: Boardwalk at the approach to the Bosque Zaninelli, Curitiba, Brazil
Source: Image by author

8.2 Parque das Pedreiras

This park, named after the Brazilian poet and writer Pedreira Paulo Leminsky, was established in 1992 in the abandoned João Gava municipal stone quarry. Featuring an open-air seating area accommodating 60 000 people, with a stage utilising the vertical excavated rock face as backdrop, this facility is one of Curitiba's most popular cultural destinations and is used for musical events and religious gatherings. The park also houses the Ópera de Arame (The Wire Opera House), an iconic Curitiba landmark

designed by architect Domingos Bongestabs (see Figure 7).

8.3 Parque Tanguá

This natural park was opened in 1996 on a site that was previously mined for stone from two adjoining quarries. After the quarrying was abandoned, the City developed the park with various facilities, including a lookout point over the quarry lake (see Figure 8); various hiking, jogging and cycling pathways; a coffee shop, and a jetty for boating. The two quarries are linked with a tunnel that now serves to drain excess ground and surface water. The park forms part of the Barigui River catchment and, although the water quality is currently being addressed as part of the river system revitalization project, it is still considered acceptable for recreational activities such as boating and canoeing (see Figures 8 and 9) (Biocidade, s.a.: online).

In all three of the Curitiba case studies, it can be observed that local vegetation has been allowed to establish naturally, the quarry excavations have filled with ground and surface water, in the process promoting new aquatic ecosystems, and urban 'man-made wildernesses' have now emerged.

9. FINDINGS AND DISCUSSION

The need of urbanites to have access, for outdoor recreational purposes, to parks, natural areas and the 'wilderness' has been well documented. It has become difficult for urbanites to satisfy this need in places that are considered 'untainted' or 'natural wilderness', mainly due to distances they have to travel, their ability to do so and, more importantly, to find places that can still be defined as 'wilderness', based on the perceptions held at the end of the 19th century. From the literature survey, it is clear that human beings, specifically urbanites, have to re-evaluate their concept of wilderness; 'untainted wilderness' is at best a fallacy since, as Cronon (1996a) and Olwig (1996) argue, wilderness is a human construct and the natural values that human beings allocate to their environment do not originate from the physical nature, but from society.



Figure 7: View onto the lake at the Parque das Pedreiras, with the Ópera de Arame (The Wire Opera House) to the right, Curitiba, Brazil

Source: Image by author



Figure 8: View onto the lake at the Parque Tanguá, with the lookout to the top right, Curitiba, Brazil

Source: Image by author



Figure 9: View onto the lake at the Parque Tanguá from the lookout, Curitiba, Brazil

Source: Image taken by author

Reclaimed urban post-industrial quarries have the potential to become our cities' parks, recreational spaces, 'nature' areas and often offer the only opportunity for urbanites to experience the 'wilderness'. An analysis of the literature on this topic and case studies investigated has shown that post-industrial urban quarries' biophysical and socio-economic attributes can lend them to be reclaimed as enclaves of 'nature' and 'wilderness' in urban settings; this could be described as transformative resilience, *i.e.*, the ability to regenerate a collapsed natural or social system (Chapin *et al.*, cited in Peres, Barker & Du Plessis, 2015: 40).

The wide and often overlapping or unclear array of South African Acts, ordinances, by-laws and other legislative instruments that regulate spatial planning and land-use change in South Africa currently creates confusion. Recent legislation such as the SPLUMA (Act 16 of 2013) (RSA, 2013) is, however, aimed at aligning these legislative processes and clarifying where responsibilities lie.

Allen (2012: 159) refers to post-industrial urban quarries as unique opportunities; the evolution and recasting of their spatial condition offer the possibility of space, experience and integration with ecological process hitherto rarely appreciated: "In dereliction they then present a nascent order not devoid of constraint, but providing a robust and thus actively adaptable system..." (Allen 2012: 158). This robustness and adaptability provide the best opportunity for exciting and innovative re-use of sites such as post-industrial urban quarries.

Once we believe we know what nature ought to look like – once our vision of its ideal form becomes a moral or cultural imperative – we can remake it so completely that we become altogether indifferent or even hostile toward its prior condition. Taken far enough, the result can be a landscape in which nature and artifice, despite their apparent symbolic opposition, become indistinguishable because they finally merge into one another (Cronon, 1996b: 40).

10. CONCLUSIONS

In addressing the three objectives of this article, first, to examine the concept of wilderness in an urbanised world, it has been shown that wilderness is a human construct and as such should be able to be redefined in a new paradigm that reflects expanding urbanism and decreasing 'natural wilderness' areas, while still recognising our need for access to 'natural' and 'wilderness areas'.

Secondly, due to their biophysical and socio-economic nature, post-industrial urban quarries are well placed to be reclaimed as sites where our need for outdoor recreation spaces, nature and wilderness, albeit man-made, can be fulfilled. The latent potential of such degraded and abandoned urban sites to regenerate natural and social systems and, in the process, enhance the resilience of cities cannot be overlooked (Peres *et al.*, 2015: 40).

Thirdly, although the legislative processes that must be followed to decommission, rehabilitate, change the land-use, rezone and redevelop post-industrial urban quarries in South Africa can be considered overly complex and confusing, they do make provisions to attain the full second life potential of our post-industrial urban quarries.

Post-industrial urban quarries, therefore, have the potential to transition from landscapes of production of sand, clay and gravel, to landscapes where natural and societal values can be consumed by the urban dwellers and urban resilience regenerated.

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