JOURNAL OF ENGINEERING AND APPLIED SCIENCE, VOL. 67, NO. 3, JUNE 2020, PP. 507-526
FACULTY OF ENGINEERING, CAIRO UNIVERSITY

THE DEVELOPMENT OF MINING CITIES IN EGYPT USING INTEGRATED CLOSURE PLANNING APPROACH

T. A. ELSEOUD[1], S. A. AMER[2] AND N. S. MOHAMMED[3]

ABSTRACT

Since 1980, the mining sector has grown globally for urban sustainable development initiatives. Egypt as a developing country is one of the richest worldwide in mining resources. Egypt faces urban problems to deal and manage cities with mining resources. One of main challenges of mining cities in the Egyptian environment is applying the traditional planning process for urban management for such type of cities. The research proposes the introduction of a new environmental urban integrated closure planning approach for the planning of Egyptian sustainable mining cities. One of the major outputs of the proposed methodology of environmental urban approach is post-mining land use of mining cities. The research will examine the approach on the Golden Triangle zone as a case study in South Upper Egypt.

KEYWORDS: Sustainable mining, Integrated Closure Planning Approach (ICP), post-mining land use, shrinking mining cites, rehabilitation, TSM**.**

1. INTRODUCTION

Natural resources are an important part of any country's sustainability considerations [1]. Minerals are also critical to social - economic sustainability [2]. These sources have intrinsic traits making it a double-edged sword, as it represents a problem and an opportunity for development at the same time [3]. Unlike renewable resources (e.g., water and land), mineral resources are non-renewable and will someday be depleted, thus the mining process is considered as a brief use of land [4, 5]. The un-sustainable use of such resources in developing countries raises global concerns [6]. Egypt, as one of these developing countries, has vast potentials and resources of mineral resources [7]. More than 94% of Egypt's land contains mineral

[1] Assistant Professor, Faculty of Regional and Urban Planning, Cairo University.
[2] Professor, Faculty of Regional and Urban Planning, Cairo University.
[3] Teaching Assistant, Faculty of Regional and Urban Planning Cairo University. eng_nada20072012@yahoo.com

resources and raw materials, which vary in quantity from location to location. Mining resources extend from the vast desert of the South with gold and quartz while to the North coal and iron are dominant [8]. Phosphate resources spread from the Red Sea coast to the Oasis over a length of 750 km, black sand reserves of up to 3000 million tons are found in the Red Sea among other resources. These resources have not yet been optimally exploited, resulting in a vulnerable contribution of the mining sector to the GDP in Egypt, which is much less than 0.5% [8].

In the context of a burgeoning literature, sustainable development studies in the context of minerals and mining are concerned with sustainability at the global and national levels [9]. Early contributions focused on how the mineral resources could be sustained from generation to generation [4]. Global initiatives accordingly focus on maximizing the development benefits of mining while improving the environmental and social sustainability of the mining sector that first emerged in the Johannesburg Plan of Implementation (JPOI) 21 [10]. In this context, the knowledge gap in Egypt shows that, despite the recent proliferation of research on mining cities worldwide, academic attention to the current challenges facing mining cities may be absent. Mining cities provide illustrative examples of how communities influence their development path while considering the Global economic forces in an attempt to achieve the goals of sustainable development within the framework of its four principles.

One of the directives of the Egypt 2030 strategy addresses the security, equitable and optimal use and investment of natural resources [11]. The dilemma in Egypt, in the absence of thought and planning methodology, is concerned with the sustainability of urban communities depending on the accessible mineral resource. The omission of determining the developmental outcome of exploitation of mining resource, and ignoring the specific situation of such urban communities leads to the transformation of some of these cities to the so-called ghost towns such as Abu-Tartour and some cities in Sinai. Therefore, the research methodology is concerned with a review of the concept of sustainable mining cities and together with the global concepts and agendas in order to identify the frameworks and approaches concerned

with the sustainability of urban development within the scope of these resources. The framework, derived from the experiences, will be used to determine the Egyptian gap and will be compared with a designed methodological framework appropriate to the Egyptian case. The Golden Triangle was chosen, as it is a huge national project, which has political support to reduce the regional disparities in South Egypt. Egypt East Gate Icon, included different types of mineral resources for which economic developmental integration can be achieved. Human development indicators could then be improved and the GDP will thus be positively affected. Infrastructure networks are also being implemented that will contribute to development.

2. RESEARCH OBJECTIVE

The aim of the research is to adopt the Global directives supporting the sustainability of mineral resource in the urban clusters and the identification of a developmental approach for the sustainability of the urban clusters based on the mining resource in Egypt. This would enable the preservation of the ecosystem of the mining city together with urban development and sustainable alignment of the nature of the permeability of resource mining. Therefore, the research considers the following items: sustainable mining cities, frameworks and approaches for sustainable mining cities, Integrated Closure Planning (ICP) approach, and proposes the implementation of the ICP to the Golden Triangle in Egypt.

3. LITERATURE REVIEW

The global agendas towards sustainable mining and the principles of achieving them will be outlined below indicating what are the sustainable mining cities and the importance of closure mining as an opportunity for sustainable development. The determination of appropriate frameworks and approaches for achieving this will be then discussed along with the variables and factors within the application of this approach and the suggestions for land uses to achieve the ecosystem before mining activity and to avoid access to so-called ghost towns or shrinking cities.

3.1 Sustainable Mining Cities

Mining is different to most other land uses in that it is temporary and ceases when the ore body is exhausted [12]. Thus, many global initiatives emerged such as Principle 8 from the Rio de Janeiro Conference. Other initiatives such as, UNDP, proposed an Atlas for the sustainability of mining resources [13]. Another initiative that called Towards Sustainable Mining (TSM) was from the Mining Association of Canada (MAC), TSM guiding principles 2014. The TSM includes: the importance of engaging stakeholders, transparency, protect health and safety, optimal use, minimize the impact on the eco system and innovation. In addition, all aspects of TSM member business and operations will: respect human rights, cultures, all laws and regulations to provide lasting benefits to local communities. The foregoing list presents elements of the "three pillars of sustainability" which are covered in TSM [14, 15].

The research aims to follow the principles of TSM Egypt and put Sustainable Development Goals (SDGs) into consideration when proposing a planning methodology for the urban development of the mining areas in Egypt. Based on all previous initiatives mine closure has become an increasingly important issue [16]. Closure of a mine with appropriate planning is a recent move as a part of sustainable mining practice [17, 18]. This is what the research seeks to achieve by proposing a methodology to ensure sustainability for mining cities.

A mine is a provider of income, employment, and services in a local economy. The closure of a mine thus has significant impacts on the well-being of the community. This impact is extreme in developing countries where local government lacks capacity to structure a development process that would provide alternative economic opportunities [19-21]. The concept of mine sustainability and acceptable land-use [22, 23] occurs when reclamation will be considered and incorporated into the mine planning in a way to make it a key ruling component inside the mining operations [24]. This has to take into consideration laws and regulations by Federal Government to ensure a safe environment [23, 25]. Mining cities should not reach the stage of contraction known as shrinkage cities [21]. This is one of the stages of the growth of mining cities, and faces multi- dimensional challenges regarding how to

balance the needs of its populace and the environmental requirements. Interventions can contribute definitely within the city long-term [26, 27]. Therefore, the world is now turning to the frameworks and approaches that ensure the sustainability of mining cities.

3.2 Frameworks and Approaches for Sustainable Mining Cities

The mining cycle entails numerous stages starting with initial exploration, mine making plans, construction, mineral extraction/processing, down to the stage of mine closure (planning/ implementation) and reclamation and rehabilitation (post closure scenario) and post- closure monitoring and maintenance [28].

Many frameworks deal with the life cycle of the mineral resource to ensure the sustainability during the mining process, such as material and energy flow analysis (MEFA), Life Cycle Assessment Framework (LCA), RACER, etc. Some frameworks and approaches attempt to ensure sustainability of mining urban communities, to prevent these urban communities from reaching the stage of shrinkage. These include the Integrated Closure Planning (ICP) approach, which is outlines the algorithm for the development of sustainability evaluation, Mineral Safeguarding Areas approach (MSAs), which is a Structural Equation framework (SEM), and the degree of sustainable development of mineral resources (DSDMR).

Most of the previous frameworks are concerned with stage of operation in the resource life cycle and stage of growth and maturity for the urban assembly. The ICP approach deals with the idea of depletion of mineral resources. This approach also has a direct relation to the spatial planning (land use) and this has a direct relationship with the proposed research.

3.3 Integrated Closure Planning Approach (ICP)

The mining for closure planning approach includes related environmental, social and economic issues, as well as the participation of stakeholders, particularly in consideration of land rehabilitation objectives [17]. The goal of closure process both reclamation/rehabilitation is to restore "the surrounding environment and achieving the

principles of sustainability" [29], and to allow alternative land use [17. 30]. process Planning for the closure of a mining operation should be carried out as part of the due feasibility study process [12, 31] in which transient shutdowns for economic or other motives are not considered closure [32], Which includes many studies [33]. The approach identified variables and factors that must be Consider for the applicability of ICP methodology appear as follows:

3.3.1 ICP Factors and variables investigation

Land use planning is a visual spatial process [34]. Mine closure practices started starting in the late 1960s and early 1970s in countries with advanced economies and mature mining industries [22]. These practices continued to evolve and incorporated socio-economic and cultural aspects, especially after the Brundtland Report in 1987 and the consequent Earth Summit in 1992. In addition, the traditional method used is sub-optimal and reduces the ultimate contribution of a mine to long-term [12]. The objective of post-mine land-use and reclamation making plans is to identify suitable alternate land-makes use of [35] include: i) restoration goal; ii) restoration objectives and iii) measurable success standards [25]. There are four useful steps for the strategy planning stage of a proposed mining city. The first step is the identification of landscape and soil characteristics that would be required to re-establish the authentic local or commercial ecosystem. The second step is the evaluation of the useful resource inputs required to gain sustainable 'unique' surroundings and an appropriate ecosystem. The third step is the estimation of the resource gap among unique and alternative ecosystems. Finally, the fourth step addresses change of the character or degree of disturbance effect in relation to the target environment to obtain sustainable results [25, 36].

Identification variables [37], such as the geomorphic, climatic, hydrologic, stratigraphic, and soil characteristics of a site which are classified as natural land-use factors, and factors inclusive of geographic, demographic, and economic characteristics which might be the effects of human activities and labeled as cultural factors [28]. Land resources, ownership, form of mining activity [25, 31] and legal

necessities (e.g. zoning legal guidelines) have additionally been diagnosed as key elements that affect the selection of publish-mining land-use. [31]. Also, economic, social, environmental and technological factors were identified as major groups to be considered for the identification land uses [38-40]. In addition to essential to consider the larger regional scale with regard to mine closure planning and for mines not to be closed in isolation. There is a need for case studies and the development of processes for this regional approach [41].

From the reviewed literature, it is obvious that one must consider an array of factors in planning the choice of a post-mine land-use and reclamation. These factors include culture factors, social factors (geographic, demographic, etc.), economic factors (human activity, local economy, etc.), environmental factors (natural land use, topographic, climatic, soil, hydrologic, etc.), eco system and biodiversity factors (landscape, pre-design, hazards). The literature on the subject directly or indirectly highlights the importance of evaluating each of these factors based on sound analysis influenced by location, needs of the community and the financial implications of the choices.

3.3.2 International ICP practice

The methodologies for spatial planning in mining areas based on non - renewable resources have been proposed to ensure the sustainability of urban development in different case studies and proposing land uses for post-mining, which is directly related to spatial planning, legislation and political factors and ensure involvement of stakeholders. These experiences will influence the identification of the stages of the proposed a planning methodology and the background of environmental and urban issues in these experiences.

Hon Gai in Vietnam suffering from Land scarcity and need to reclaim the surrounding land so that followed a planning methodology for proposed land use planning: involvement stakeholders in the post-mining land use planning process, determine planning and management data, planning maps, planning units, concept for post-mining land use planning, identification of buffer zones, roadmap [34]. In

Finland, mines were commonly located in densely populated areas or next to the villages. In planning methodology, case studies were based on basic phases and focusing on post-mining land uses which is similar to that of Vietnam and differ in some phases: landscape analyses, general characteristics of closed mines [31].

The case studies of both Serbia and Romania and of Canada and Australia, indicated that the development of the mining sector need updated legislation and clear political support from investors and local communities and civil society [17, 41]. The international ICP approach focuses largely on the phases of planning, institutional dimension, and alternative land use planning in mining cities as presented in Table 1.

Table 1. Post- mining land use alternatives.

Mining activity	Post-mining land uses	Mining activity	Post -mining land uses
Open pit mines	Schools	Underground mines	Residential area
	Military facilities		Industrial area
	A nature/geological trail		R&D place
	Fire rescue exercises		Mining museum
	Concerts		Green area
	A mining themed holiday village		Park forest
	R&D place		Recreation area
	Residential area	Waste rock dump	Local recreation area
	Industrial area		Viewpoint
	Forest		Sports (a golf and disc golf courses- greyhound racing- rally and dirt-bike tracks- swimming place - popular dive sites)
Buffer zone			Open air museum/ Green space

4. DISCUSSION

Through the review of theoretical literature and international experiences that dealt with the idea of closure to ensure the sustainability of urban communities in the mining areas, the research reached a proposed ICP for mining cities. The methodology

of this approach is committed to a general framework consisting of agendas and global environmental agreements, TSM principles, National strategies and trends, Stakeholder (communities, localities, employment, etc.). The proposed ICP methodology for mining cities consists six main phases as shown in Fig. 1. Phase I: (pre-mine environmental description) is concerned with determining the natural environmental status of the mine through studying the natural environment (natural land use factors (topographic, climatic, soil, hydrologic), eco system and biodiversity, landscape pre-design, hazard). Phase II: (mine operational life) is concerned with identifying impacts and issues resulting from the mining process (environmental base line) through scoping some elements of the mining site (spatial data on mining and land use, general characteristics of mines, facilities, planning maps, land resources, owner ship, types of mine activity, landscape, etc.). The identification of social, environmental, economic issues and legal requirement through the previous two stages, helps in the transition to the third phase. Phase III: (reclamation and re-habitation) is concerned with determining requirements, needs to refer to the pre-mining environment (land scape pre-design) through studying culture, social, technical, economic, environment factors to determine suitable post–mining land use. This phase is the beginning of the sustainability of urban communities in mining areas. Phase IV: (evaluation of land use alternatives) identifies the alternative development uses and opportunities that fit the local community with its characteristics and local economy through evaluation of land use alternatives to determine sustainable proposed land uses for mining cities. Through the four previous phases we can define the land use planning for mining cities and this is Phase V, in order to ensure the sustainability of these mining communities, we need a roadmap to monitoring and auditing the planning phases. This stage is concerned with identifying policies and steps that are compatible with the developmental thinking directed by the strategies and directions at the state level. Phase VI is divided into two main steps, the first is during reclamation and re-habitation in various stages of growth of urban communities in mining areas (Reborn – Mature –Growing- shrinkage).

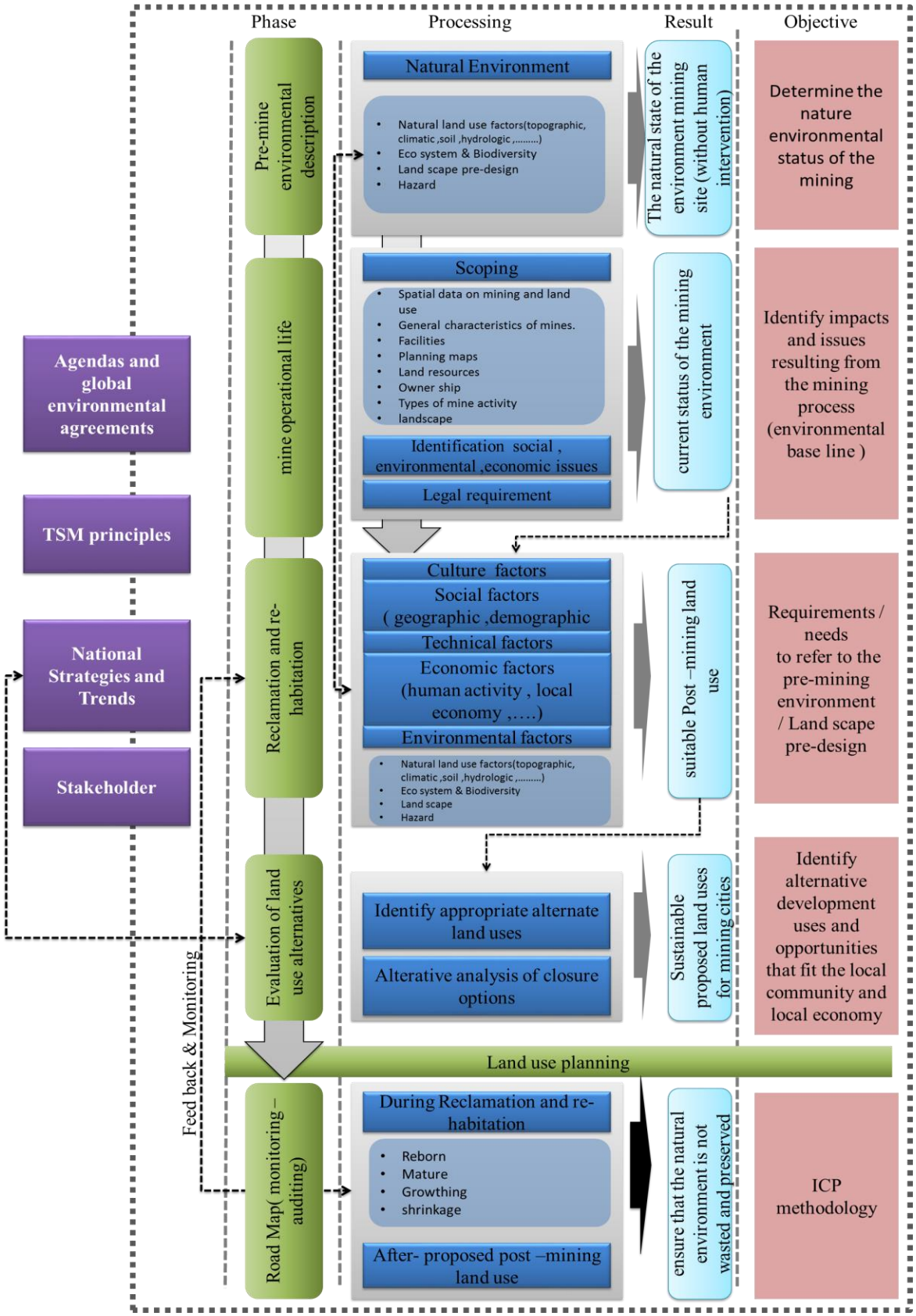

Fig. 1. The proposed ICP methodology for mining cities.

The proposed methodology for this approach will enable the realization of the sustainability thinking of the mining communities for the specificity of their developmental situation and in line with the orientations and strategies of the Egyptian state (national strategic plan 2052 and sustainable development strategy: Egypt's Vision 2030). The location of the golden triangle will be chosen as one of the richest mining areas in Egypt.

5. DEVELOPMENT PLAN OF GOLDEN TRIANGLE OF MINERAL WEALTH (QENA/QEFT-SAFAGA-USAIR)

In the context of the specificity of the mineral resource and permeability and with the State's direction of sustainable development in the mining sector and with the identification of research the importance of compatibility with global thought and use it to determine what is appropriate for the Egyptian case and after reviewing the literature. The case of the study was determined by the Golden Triangle to compare its methodology with the theoretical methodology through checklist and design the appropriate methodology for the Egyptian case and the Golden Triangle.

5.1 Definition of the Study Area

The Golden Triangle area is located in the Upper Egypt region of the Red Sea and Qena Governorates as shown in Fig. 2. It runs along the coastal road that connects the eastern border of Egypt from the north to its southern border. The mineral triangle consists of four administrative centers in the Red Sea/Qena governorates (Qena/Qift/Safaga/Qusair). The region is characterized by the availability of many natural and human resources, making it an attractive investment area. It contains the vast majority of ores of ferrous metals (iron, manganese, chromium, tungsten, molybdenum, nickel, (Copper, lead, zinc, tin, aluminum), precious metals (silver gold) and non-metallic minerals (quartz, white sand, asbestos, zircon, phosphate, sulfur, potassium). Lamas building materials (sand, gravel, limestone and dolomite) as well as ornamental stones, precious stones and other resource materials [42].

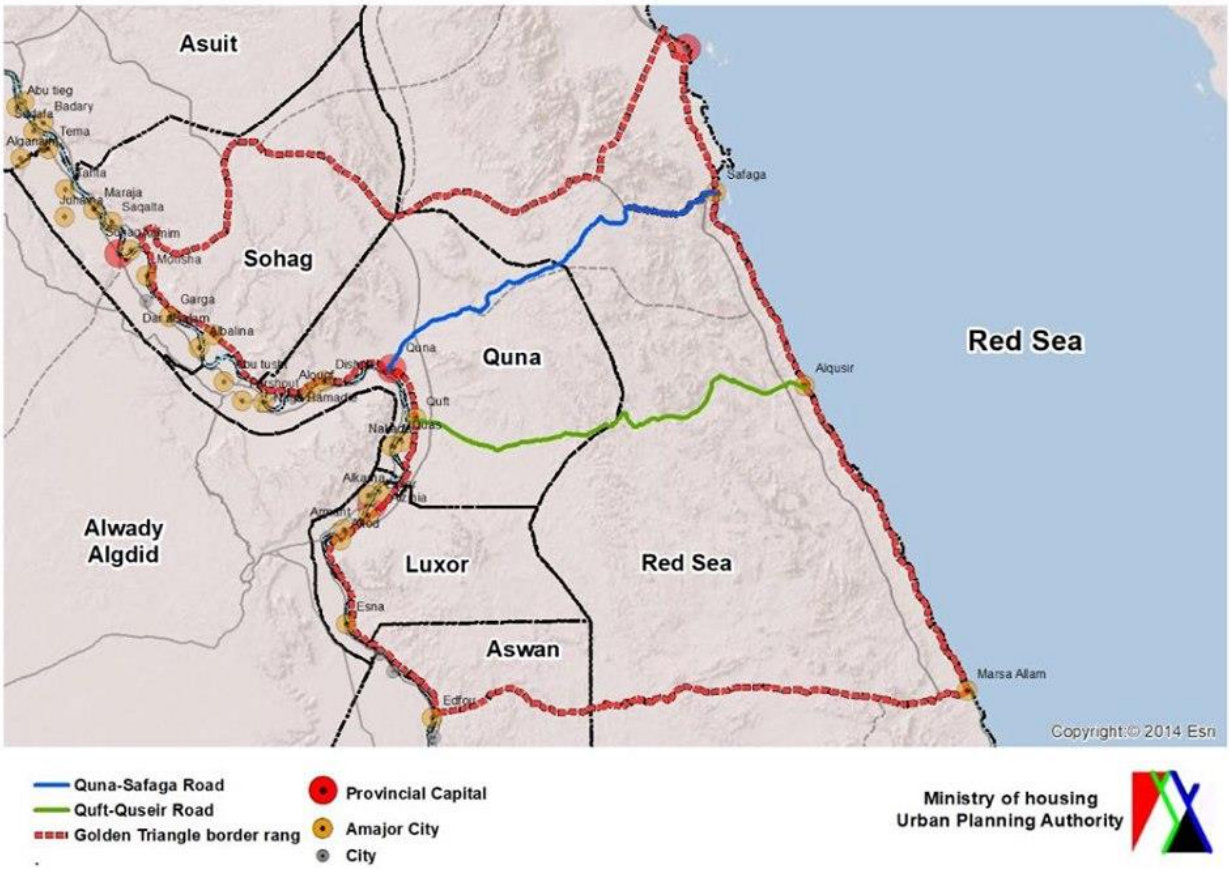

Fig. 2. Golden triangle border range [42].

5.2 Methodology of the Project of Development of the Golden Triangle (Qena/Qeft/Safaga/Qusair)

The work methodology of the mining triangle as shown in Fig. 3 was based on three phases' national and regional studies, development of the golden triangle, and proposed development plan for the golden triangle. The first phase was concerned with the determination of the actual impact ranges of the mining triangle, the second phase was concerned with studying the terms of reference for the golden triangle, and the third phase was concerned with the development plan of the golden triangle through some detailed studies as described. The final phase of the methodology is the most important phase of mining studies.

The research identified elements of the theoretical methodology of (ICP) as criteria for comparison between this methodology and the methodology of the mining triangle in Egypt using the checklist presented in Table 2. This would highlight the

strengths in the National strategies and trends, to identify the issues of case study. The weaknesses include not addressing all stakeholders and neglecting to shape the site before the current existing activities. The mining area was not chosen at any stage of the mine life cycle, and the post-mining phase was not considered. The determination of the strengths and weakness are necessary to modernize the development plan of the golden mining triangle.

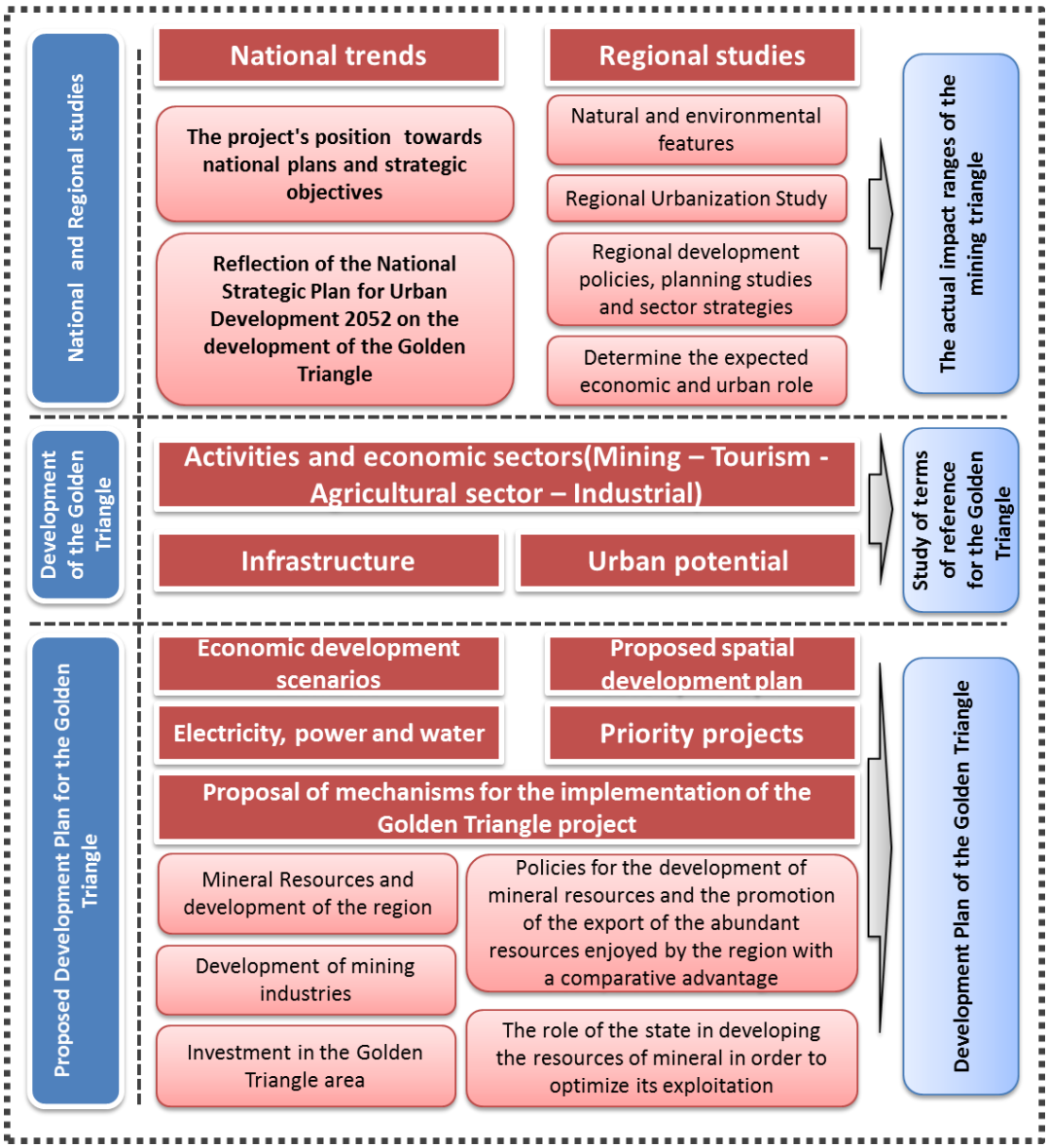

Fig. 3. Current methodology of development for golden triangle.

Table 2. A comparison checklist for the proposed methodology with the theoretical approach.

Phase	Process (studies) Literature and international experiences		Golden Triangle Project
Agendas and global environmental agreements			X
TSM principles			X
National Strategies and Trends			√
Stakeholders			*
Pre-mine environmental description	Natural Environment	Natural land use factors (topographic, climatic, soil, hydrologic,…)	*
		Eco system & Biodiversity	X
		Land scape pre-design	X
		Hazard	√
Mine operational life	Scoping	Spatial data on mining and land use	√
		General characteristics of mines.	X
		Facilities	√
		Planning maps	√
		Land resources	√
		Owner ship	*
		Types of mine activity	X
		landscape	X
Reclamation and re-habitation		Culture factors	X
		Social factors (geographic, demographic,...)	√
		Technical factors	X
		Economic factors (human activity, local economy,…)	√
	Environmental factors	Natural land use factors	X
		Eco system & Biodiversity	X
		Land scape pre-design	X
		Hazard	X
Evaluation of land use alternatives	Identify appropriate alternate land uses		X
	Alterative analysis of closure options		X
Land use planning			X
Road Map (monitoring – auditing)	During Reclamation and re-habitation	Stages of growth urban communities(Reborn- mature- growing –shrinkage)	X
ICP For Golden triangle			X

Legend: √ (Yes); X (No); * (Partially)

5.3 Proposed Methodology for Golden Triangle Using ICP

In the framework of the previous Table 2 and the methodology derived from the literature for ICP for mining cities and in the framework of determining the strength and symmetry between the proposed theoretical methodology and the methodology of the Golden Triangle mineralization plan in the Red Sea. Social, economic and environmental conditions, taking into account the analysis of economic and social factors as well. It is important to consider some aspects that have been overlooked in the Golden Triangle Plan methodology. These are weak points, such as the omission of determining typology of urban communities in the scope of mining resources, and the failure to determine the site's studies before and after the mining process. In the framework of the above, we can determine the proposed ICP methodology for mining cities in Egypt, golden tringle as shown in Fig. 4.

6. RESEARCH CONCLUSIONS

- Dealing with the mining regions and cities as areas of special nature of their privacy, where we are dealing with a supplier enforceable and non-renewable and use is a temporary use of the land, in addition to Development of post-mining land uses as an opportunity for sustainable urban development.
- Adaptation with the global thinking that supporting the sustainability of the mineral resource in the urban clusters and the identification of a developmental approach for the sustainability of the urban clusters based on the mining resource in Egypt.
- ICP approach is the appropriate input to the thought of spatial planning, which is the approach to be incorporated into planning process for the mining areas from the beginning to avoid the weaknesses of traditional methodologies used.
- ICP methodology is committed to a general framework consisting of Agendas and global environmental agreements, TSM principles, National Strategies and Trends, Stakeholder with a roadmap to monitoring and auditing with identifying policies and steps that are compatible with the developmental thinking in Egypt.

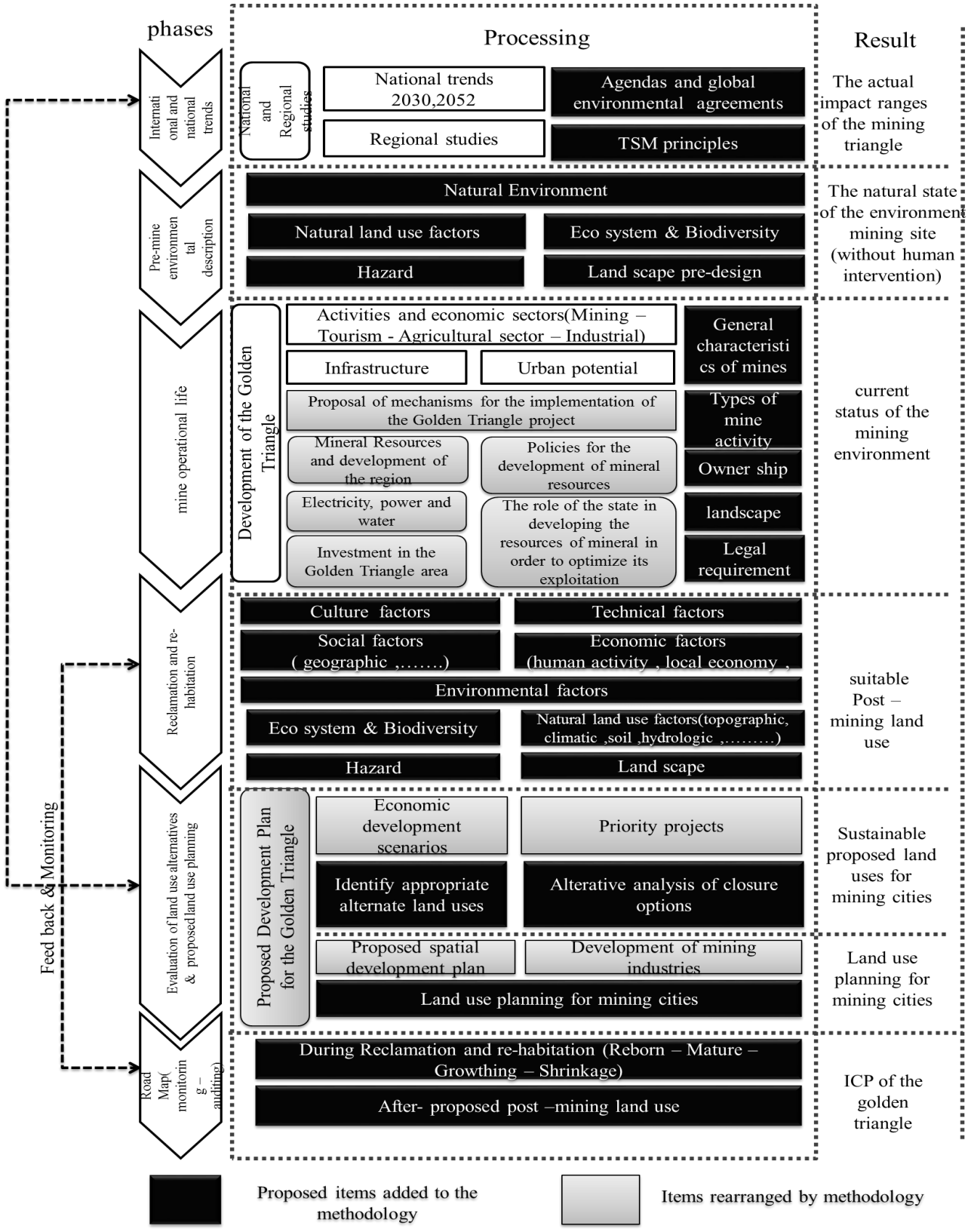

Fig. 4. A proposed ICP methodology for mining cities in Egypt, golden tringle.

- Finally, future research areas in this field include the assessment of the life cycle of mining resource production, economics of allocation of sustainable mining activity, elements of mining tourism allocation, indicators to measure the growth phase of mining communities in Egypt.

DECLARATION OF CONFLICT OF INTERESTS

The authors have declared no conflict of interests.

REFERENCES

1. USDA Forest Service, "National Report on Sustainable Forests 2003", FS-766. Government Printing Office, Washington, D.C, 2014.
2. Shields, D. J., "Nonrenewable Resources in Economic, Social and Environmental Sustainability", Nonrenewable Resources, Special Issue: Sustainability for Nonrenewable Resources – Alternative Perspectives. Vol. 7, pp. 251-261, 1998.
3. Shields, D. J., and Šolar, S. V., "Sustainable Mineral Resource Mangement and Indicators: Case Study, Slovenia", Geological Survey of Slovenia, pp. 9-12, 2004.
4. Yua, J., Zhang, Z., and Zhou ,Y., "The Sustainability of China's Major Mining Cities", Journal of Resources Policy, Vol. 33, No. 1, pp. 1-2, 2007.
5. Malaviya, S., Munsi, M., Oinam, G., and Joshi, P. K., "Landscape Approach for Quantifying Land use, Land Cover Change (1972–2006) and Habitat Diversity", Environmental Monitoring and Assessment, Vol. 170, pp. 215-229, 2010.
6. Zhanga, J., Raoa, Y., Gengd, Y., Fu, M., and Prishchepov, A. V., "A Novel Understanding of Land use Characteristics Caused by Mining Activities: a Case Study of Wu'an, China", Ecological Engineering ,Vol. 99, p. 68, 2017.
7. Abouzeid, A. M., and Khalid, A. M., "Mineral Industry in Egypt-Part I: Metallic Mineral Commodities", Natural Resources, Vol. 2, No. 1, pp. 35-49, 2011.
8. Ministry of Petroleum and Mineral Resources, "Managing Data Preparation and Statistics", 2010. http://emra.gov.eg/UI/Lang1/TDIDataShow.aspx?ID=51/ (Accessed 20/1/ 2019).
9. Hilson, G., and Murck, B., "Sustainable Development in the Mining Industry: Clarifying the Corporate Perspective", Resource Policy, Vol. 26, pp. 227-238, 2000.
10. https://sustainabledevelopment.un.org/topics/ mining/. (Accessed 3/3/2019).
11. Egyptian Civilization, "Sustainable Development Strategy (SDS): Egypt Vision 2030", 2015. http://www.cabinet.gov.eg/english/governmentstrategy/ pages/egypt%E2%80%99svision2030.aspx/ (Accessed 23/2/2019).
12. Limpitlaw, D., and Briel, A., "Post-mining Land use Opportunities in Developing Countries - A review", Proceedings of the Mining, Environment, and Society Conference, South Africa, pp. 137-141, 2014.
13. UNDP, "Mapping Mining to the Sustainable Development Goals", World Economic Forum, pp. 3-5, 2016.

14. Jeswiet, J., “Including Towards Sustainable Mining in Evaluating Mining Impacts”, Procedia CIRP, Vol. 62, pp. 497-498, 2017.
15. Bôas, R. V., Shields, D., Solar, S., Anciaux, P., and Önal, G., “A Review on Indicators of Sustainability for the Minerals Extraction Industries”, CYTED, Rio de Janeiro, Brasil, 2005.
16. Knierzinger, J., and Sopelle, I. T., “Mine Closure From Below: Transformative Movements in Two Shrinking West African Mining Towns”, The Extractive Industries and Society, Vol. 6, No. 1, pp. 1-2, 2018.
17. Popović, V., Miljković, J. Z., Subić, J., Jean-Vasile, A., Adrian, N., and Nicolăescu, E., “Sustainable Land Management in Mining Areas in Serbia and Romania”, Journal of Sustaunability, Vol. 7, No. 9, p. 2, p. 7, 2015.
18. World Bank, “It’s Not Over When It’s Over: Mine Closure around the World”, Mining and Development Series, World Bank and International Finance Corporation, p. 19, 2002.
19. https://www.semanticscholar.org/paper/MINE-CLOSURE-AS-A-FRAMEWORK-FOR-SUSTAINABLE-Limpitlaw/e70b11ff7d933f6a0f3f79dc15c4dca4007c7592, (Accessed 10/3/2018).
20. Dale, B., “An Institutionalist Approach to Local Restructuring: The Case of Four Norwegian Mining Towns”, European Urban and Regional Studies, Vol. 9, No. 1, pp. 5-20, 2002.
21. Fernandez, C., WU, C., Schatz, L., Taira, N., and Hernandez, J., “The Shrinking Mining City: Urban Dynamics and Contested Territory”, International Journal of Urban and Regional Research, Vol. 36, No. 2, pp. 245-247, 2012.
22. Bowman, B., and Baker, D., “Mine Reclamation Planning in the Canadian North”, Northern Minerals Program Working Paper, Canadian Arctic Resources Committee, No. 1, 1998.
23. Maczkowiack, R. I., Smith, C. S., Slaughter, G. J., Mulligan, D. R., and Cameron, D. C., “Grazing as a Post-Mining Land-use: A Conceptual Model of the Risk Factors”, Agricultural Systems. Vol. 109, pp. 76-89, 2012. http://dx.doi.org/10.1016/j.agsy. 2012. 03.002/ (Accessed 3/3/2018).
24. Johnson, M. S., Cooke, J. A., and Stevenson, J. K., “Revegetation of Metalliferous Wastes and Land after Metal Mining”, Environmental Science and Technology, Royal Society of Chemistry, England, pp. 31-48, 1994. http://dx.doi.org/10.1039/9781847551467 -00031/ (Accessed 3/3/2018).
25. Mborah, C., Bansah, K. J., and Boateng, M. K. , “Evaluating Alternate Post-Mining Land-uses: a Review”, Enivronment and Pollution, Vol. 5, No. 1, pp. 14-18, 2016.
26. Elewa, A. K., “Innovative Urban Interventions as an Approach for Livable and Sustainable Cites”, Journal of Engineering and Applied Science, Vol. 66, No. 3, pp. 355-357, 2019.
27. He, S. Y., Lee, J., Zhou, T., and Dan, W., “Shrinking Cities and Resource-Based Economy: the Economic Restructuring in China's Mining Cities”, Cities, Vol. 1, 2016.

28. Laurence, D., "Optimization of the Mine Closure Process", Journal of Cleaner Production, Vol. 14, pp. 285-288, 2005.
29. Kumar, N. P., "Review on Sustainable Mining Practices", International Research Journal of Earth Sciences, Vol. 2, No. 10, pp. 26-28, 2014.
30. Kivinen, S., "Sustainable Post-Mining Land use: are Closed Metal Mines Abandoned or Re-Used Space?", Sustainabilty, Vol. 9, pp. 1-10, 2017.
31. Nehring, M., and Cheng, X., "An Investigation into the Impact of Mine Closure and its Associated Cost on Life of Mine Planning and Resource Recovery", Journal of Cleaner Production,Vol. 127, pp. 1-2, 2016.
32. COCPO, World Bank, "Towards Sustainable Decommissioning and Closure of Oil Fields and Mines: A Toolkit to Assist Government Agencies", 2010.
33. https://www.industry.gov.au/sites/default/files/2019-04/lpsdp-a-guide-to-leading-practice-sustainable-development-in-mining-handbook-english.pdf (Accessed 20/1/2019).
34. Broemme, K., Stolpe, H., Borgman, A., Greassidis, S., Jolk, C., and Zindler, B., "Development of a Methodology for Post Mining Land use Planning in Quang Ninh, Vietnam", 3rd International Conference on Advances in Mining, pp. 1-8, 2014.
35. Cooke, J. A., and Johnson, M. S., "Ecological Restoration of Land with Particular Reference to the Mining of Metals and Industrial Minerals: a Review of Theory and Practice", Environmental Reviews, p. 10, pp. 41-71, 2002. http://dx.doi.org/10.1139/a01-014/ (Accessed 20/5/2018).
36. Doley, D., Audet, P., and Mulligan, D. R., "Examining the Australian Context for Post-Mined Land Rehabilitation: Reconciling a Paradigm for the Development of Natural and Novel Ecosystems among Post-Disturbance Landscape", Journal of Agriculture, Ecosystems and Environment, Vol. 163, pp. 85-93, 2012.
37. Sweigard, R. J., and Ramani, R. V., "The Site Planning Process: Application to Land-Use Potential Evaluation for Mined-Land", Annual Meeting of the American Institute of Mining, Metallurgical and Petroleum Engineers, pp. 84-88, Los Angeles, California, 1984.
38. https://nt.gov.au/__data/assets/pdf_file/0015/203415/mine-closure-and-completion.pdf (Accessed 20/1/2019).
39. Warhurst, A., and Noronha, L., "Integrated Environmental Management and Planning for Closure: The Challenges", Minerals and Energy - Raw Materials Report, Taylor and Francis Group, Vol. 14, pp. 6-11, 1999.
40. Smith, B., "Sustainable Mine Practices, Rehabilitation and Integrated Mine Closure Planning", M. Sc. Thesis, University of New South Wales, pp. 2-20, Australia, 2008.
41. Kabir, S. Z., Rabbi, F., Chowdhury, M. B., and Akbar, D., "A Review of Mine Closure Planning and Practice in Canada and Australia", World Review of Business Research, Vol. 5, No. 3, pp. 140-151, 2015.
42. Ministry of Housing., "Project Development of the Golden Plan of Mineral Wealth", General Organization for Urban Planning, Cairo, 2014.

تنمية مدن التعدين بمصر باستخدام مدخل التخطيط بالإغلاق المتكامل

يهدف البحث إلى اقتراح منهج تخطيط مكاني ملائم لخصوصية الحالة المصرية كأحد الدول النامية التي تمتلك ثروة تعدينية هائلة وتواجه عديد من التحديات لتحقيق إدارة التنمية المستدامة للموارد التعدينية، منها عدم مراعاة خصوصية حالة نفاذ المورد التعديني والتعامل مع التجمعات العمرانية التعدينية بمنهجيات التخطيط التقليدية، هذا وقد راجع البحث الأطر والمداخل العالمية الناجحة في المجال وعدد من المبادرات العالمية المهتمة بتحقيق هذا الفكر، حيث تم اختيار منهج الإغلاق المتكامل لمناطق التعدين (ICP) شاملا التوزيع المكاني لاستعمالات الأراضي والاستغلال المستدام للمورد التعديني بمراحل نمو التجمعات التعدينية المختلفة وإشراك شركاء التنمية، هذا وقد تم اجراء التطبيق على المثلث الذهبي التعديني بجنوب صعيد مصر وأظهرت النتائج أنه يمكن باستخدام المنهجية المقترحة للتخطيط البيئي تحديد كيفية استغلال مدن التعدين بعد إيقاف النشاط التعديني بها.