

# Strategies for Conversion of Abandoned Quarries to Lakes for Land Use and Fisheries -- Case Studies

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## Abstract

Once quarrying is over, it gives the problems for the land use for the area, as they are not suitable for vegetation purposes. However, flooding of that quarry may change the land use, if it is converted to lake. Under the Resource Management Act (RMA) 1991, it is one of the permitted activities unless specifically controlled under the regional plan. Flooding of that quarry does not take water from a stream or discharge it to a stream but it does divert groundwater. As quarries typically have steep sides and are likely to have substantial water depth when full, the Health and Safety Act (HSA), 1992 requires it to be fenced or other appropriate safety measures to be implemented according to the intended use. The water quality in the flooded quarry will depend on the morphometry of the excavated pit i.e., is it a relatively shallow river gravel extraction site with a large surface area to volume ratio, or is it an open-cast coal mine or rock or mineral extraction quarry which has been sunk deep into the ground to follow a specific rock or mineral load and/ or what is the proposed use of the lake once the quarry has been flooded. Because these flooded quarries have groundwater as their primary water source and they are likely to be surrounded by pastoral farm land, the water in the lake is nutrient enriched.

A no. of case studies is conducted in the different mining fields. It is observed that the plant material remaining in the quarry when it filled are decomposed and the bottom water oxygen levels are very low. The low oxygen in the bottom waters are exacerbated when the water column thermally stratifies. The decomposition processes associated with residual coal in a flooded coal mine may release chemical contaminants (e.g., boron) which could leak back into the groundwater contaminating the downslope streams and aquifers. Design considerations to minimize these effects include terracing the littoral zone to provide suitable substrate for growing marginal wetland plants and emergent macrophytus as a buffer zone around the lake edge. Intercept drains are installed to prevent surface runoff from adjacent land and roads entering the lake. Stock exclusion fences are erected around the lake. Within the lake, considerations are given to install aerators to keep the water column mixed. In a lake where the surface area dimensions are nearly uniform, an air-bar aerator are less efficient than an enclosed rising plume device which draws the bottom water to the surface before dispersing it laterally. These aerators are de-stratification devices which need to be in operation as soon as the lake begins to stratify in spring.

By artificial means through chemical treatment these waters are made to be non-toxic so that the hygienic conditions can be maintained. It is observed that because of enriched mineral content in the water the growth rate for different types of different types of fishes, crabs, prawns are appreciable. This man-made lakes not only solves the utilization of lands but also solves the crisis of fishes.

Keywords: Abandoned Quarries, Land Use, Fisheries, Resource Management Act, Health and Safety Act.

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# Strategies for Conversion of Abandoned Quarries to Lakes for Land use and Fisheries – Case Study

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# Introduction

India has relatively very few number of natural lakes. Usually found in Himalayan region or the flood plains of river Indus, Ganga and Brahmaputra. Although the natural lakes number is low the artificial lakes are high in number. Many of those are again from abandoned quarries. The quarries are expensive to re-vegetate, therefore making use with an artificial lake is relatively much cheaper and efficient way to utilize the space.



# Objectives of the conversions

- Life support system, i.e. land use
- Effective flood control
- Waste water treatment
- Recharging of aquifers
- Serve as habitat for fish and other flora & fauna
- Winter resort for migrating birds
- Meet the socio-cultural needs
- Providing recreational benefits etc.




# Method of performing the conversion

- It doesn't take water from stream or discharge to a stream but it does divert ground water.
- The Indian Health and Safety Act (HAS), 1992 requires it being fenced and appropriate safety measures to be implemented.
- The quality of the water will depend upon the morphometry of the excavated pit.



# Case Studies

- It is seen that due to remains of plants and decomposable materials the bottom oxygen level is very low.
- The residuals of coal in flooded coal mine may release chemical contaminants like Boron.
- Because there's a risk of contaminating the groundwater or nearby aquifers, there should be a buffer zone around the lake edge (with terracing the littoral zone to provide suitable substrate for growing marginal wetland plants and emergent macro-phytus)

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- Intercept drains are installed to prevent surface runoff
  - Stock exclusion fences are erected around the lake
  - Sometimes aerators are installed inside the lake to keep the water column mixed
  - Using treatment, the water is de-contaminated and made hygienic.
  - After this because of the abundant minerals in the water the fishes, crabs and shrimps can be grown.





# Limitations of these conversion

- Integrated management and sustainable solutions required between ministry of mines, water resource, fisheries and tourism.
- Interdisciplinary man-power for adopting integrated and holistic approach
- Capacity building of local bodies for maintenance of lakes.
- Need for a strong Institutional mechanism for implementation



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- higher allocation of financial resources, trained man power, interface between researchers and managers, methodological monitoring regarding the growth of fishes, crabs and other wetland fauna.
  - development of tourism facilities for visiting lakes and also sight-seeing.



# Conclusion

From the above study it is concluded that in spite of having limitations it will be better that if the abandoned quarry will be converted to lakes so that not only the utilization of the land will be there, but it will boost the economy through many reasons particularly through fisheries.



Thank You