# Life cycle assessment of li-ion batteries (Case study: Anodes with graphite and cobalt oxide)

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Received: 15-Dec.-2014 Accepted: 16-Feb.-2015

## Abstract

Lithium-ion batteries due to their higher energy density and lower associated environmental impacts comparing to the other batteries, recently have been highly considered. The materials used in anode, are one of the most important parts affecting batteries' energy density and environmental impacts. The aim of this study is to investigate how environmental emissions of different materials as anode for li-ion batteries can be influenced by increasing the produced energy per mass unit of active material and also how battery recycling can change the potential environmental impacts caused by batteries. In this study, the primary weight of components needed for different scenarios was identified according to the laboratory experiences, resources and literatures. Then, the primary weight data were normalized based on the identified functional unit which in this study proposed to be 1000 mAh energy produced by anode active material of battery and the inventories of all the environmental impacts and energy use related to the all components used in battery including active material (synthesized anode material), electrolyte materials ($LiPF_6$ in NMP, ethylene carbonate, dimethyl carbonate) and binder were prepared using GREET2 model's data. After classification, characterization was done based on characterization factors of CML method and finally weighting of different environmental impacts was done based on MET modeling method. The investigation of environmental impacts of batteries with graphite and cobalt oxide anode shows that batteries with cobalt oxide anode have higher greenhouse gas effects, acid gases, photochemical smog and energy use comparing to the batteries with graphite anode. On the other hand, the impacts of batteries with cobalt oxide anode when recycled can significantly decreased and therefore, it can be possible to achieve batteries with smaller size, lower weight and higher energy density with lower environmental impacts.

**Keywords:** battery anodes, energy, LCA, Lithium-ion battery, recycling.

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# Effect of forestation hardwood and softwood on soil carbon storage in Berenjestanak forest at Mazandaran Province

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Received: 16-Dec.-2012 Accepted: 01-Dec.-2014

## Abstract

The aim of this study was to investigate the effect of reforestation on physical and chemical soil properties particularly soil carbon storage in the Berenjastanak forest. Forestations were including *Acer velotinum Boiss.*, *Fraxinus excelsior L.*, *Populus nigra L.* and *Pinus brutia Ten.* A witness forest with mixed species was selected as region potential. Four soil profiles were drilled in each forestation types randomly and were gathered three soil samples from 0-10, 10-20 and 20-30 cm soil depth in each profile. Soil properties includ bulk density, percent of saturated moisture, pH, nitrogen, absorbed potassium, calcium and magnesium, organic carbon and soil carbon storage. Two way analyses of variances were applied for investigation of effect forest type on soil properties and carbon storage. Since interaction habitat with soil depth were not significant about soil properties. Mean comparison of soil properties between five habitats and three depths were performed separately. Correlation between carbon storage and other soil properties were calculated in each habitat separately. Then regression models of carbon storage were determined with step by step method. Soil carbon storage had more correlation with nitrogen, (organic carbon and bulk density), organic carbon, magnesium in the witness, *Acer velotinum Boiss.*, *Fraxinus excelsior L.*, *Pinus brutia Ten.*, and Populus *nigra L.* habitats respectively. The results show that habitat and soil depth had significant effect on carbon storage. Also first depth had most of carbon storage than two other depth but they have not significant different. Carbon storage was most in *Acer velotinum Boiss.*, habitat and low in *Populus nigra L.*, habitat.

**Keywords:** carbon storage, forestation, hardwood, softwood, soil properties.

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# Effects of land use change on soil carbon sequestration and emissions (Case study: Arid rangelands of Eivanakei, Semnan Province)

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Received: 13-Nov.-2013 Accepted: 15-Jun.-2014

## Abstract

Due to the notable role of different land uses in carbon sequestration and emission, four treatments including rangeland as control, Haloxylon plantation area, Olea plantation (olive garden), and Residential lands, were selected to study the effects of land use change on soil carbon sequestration and emissions in Eivanakei rangelands, Semnan province. Carbon stocks in vegetation and soil of each treatment were measured and the results showed that the conversion of rangelands to plant cultivation will increase the carbon stocks in vegetal parts of ecosystem. Residential Land soil carbon content is fewer than control, but olive garden and Haloxylon planted area is not significantly different from control. On the other hand, the highest annual carbon emission was observed in residential area (4526 kg/ ha/year) and the lowest in Haloxylon plantation (1606 kg/ ha/year). Most of the carbon emission from soil has occurred in August (3.32 g $C/m^2$/day) in residential areas and the lowest in February in Haloxylon plantation (0.05 g $C/m^2$/day). According to the results of carbon sequestration and emission in the study area, it is recommended to exert minimal intervention and manipulation in natural regimes during the rehabilitation projects; also proportional to the rate of increase in carbon emissions resulting from change of rangelands to residential areas, establishment of permanent sustainable and indigenous vegetation should be prioritized.

**Keywords:** carbon émission, carbon sequestration, Eivanakei rangelands, land use change.

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# Strategic educational planning for department of environment natural resources faculty, University of Tehran

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Received: 27-Apr.-2013 Accepted: 06-May-2014

## Abstract

Educational organizations due to entry new competitors in this field, they are drawing a long-term vision for them. In order to achieve an acceptable point in this field, should be internal and external factors including of the challenges and potentials of the accelerator and the opportunities, and also examines the opportunities and then attempt to formulate the optimum strategies. In this paper required information investigation through filling the questionnaires, interviews with faculty and department experts and reviewing reports and documents were prepared. This research survey the internal (strengths and weaknesses) and external environment (opportunities and threats), Department of environment of natural resources faculty of Tehran university, it has studied using SWOT analysis. Based on the results of the final score in the Internal Factor Evaluation of matrix was 0.035 and external factors Evaluation of matrix was -0.093 determined. In order to, the Department mentioned in the strategic position is conservative. To determine the attractiveness and relative priority strategies was formed quantitative strategic planning matrix that based on those results, as the best strategies was determined Environmental Excellence launched and set up new fields operational needs respectively.

**Keywords:** educational planning, environment, quantitative strategic planning, strategy formulation, SWOT analysis.

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# Determination of ecological vulnerability in Torghabeh-Shandiz Township using objective vulnerability method

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Received: 19-Mar.-2013 Accepted: 11-Aug.-2014

## Abstract

Recent experiences on disregarding the environment and continuous development have caused human to conclude that the only way to protect nature in long-term is to pay attention to environmental abilities and limitations. One of the most actions taken in this regard in management and development planning is to determine ecosystem vulnerabilities. In this way, by identifying vulnerable and sensitive areas, one will be able to prevent developments beyond the ecological abilities. Torghabeh-Shandiz Township is one of the regions in Razavi Khorasan province that was under constant developments such as buildings, establishing new residential complexes (apartments and villas) during the recent years, mostly for tourism. The objective of this study is to determine and to classify the ecological vulnerability in this area using the "objective method". For this, the region was transformed into 94 cells, 1600 ha each, and the vulnerability and classification of each cell were calculated based on different environmental gradients such as: slope, aspect, elevation, soil depth, vegetation density, climate, and geology. The results show that 19.21% of the total area was vulnerable, 53.35% sensitive, 18.4% susceptible, and 9.28% of it was classified in resistant category.

**Keywords:** development, objective vulnerability method, Torghabeh-Shandiz Township, vulnerability.

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# Monitoring the landscape changes using synoptic analysis and satellite images (Case study: Rasht township)

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Received: 08-Feb.-2013 Accepted: 25-Dec.-2013

## Abstract

This study is designed, aiming to detect changes in the composition and configuration of landscape in Rasht township between 1989 and 2011. It has been conducted applying synoptic analysis. Hence, landscape maps have been generated from three TM satellite images at 1987, 1999 and 2011 applying hybrid classification method. Some composition and configuration-based metrics including NP, PD, LSI, LPI, SHDI, CONTAG, ED and PLAND were then calculated at two class and landscape levels and their changes is detected. The results indicated that, in general, the landscape has been more fragmented, more complex and irregular in shape, more disconnected in continuity of patches and more diversified in the term of land use/ land cover types. It was in spite of the differences between trend and gradient of changes in Rasht county landscape at two period of time (1987- 1999 and 1999- 2011). Moreover, the results revealed that sprawl of the manmade areas have caused increase in fragmentation, irregularity and complexity of agriculture patches and decrease in total area of agriculture class. Hence, an intense degradation of ecosystems might be resulted if the current trend continues in future in the study area.

**Keywords:** landscape, monitoring of changes, Rasht township, satellite images, synoptic analysis.

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# Investigation on the concentration of heavy metals Ni, Cd and Pb in different ages bivalve *Saccostrea cucullata* and compared with international standards

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Received: 08-Feb.-2013 Accepted: 25-Dec.-2013

## Abstract

According to various pollution sources having adverse effects on the health of ecosystems in a region, it is important to estimate the amount of contamination in the area. In this study, Concentrations of Ni, Cd and Pb in the soft tissues of the bivalve *Saccostrea cucullata* were examined at 4 ages categories and 3 longth categories in beaches Loft Port by ICP-OES. The results showed that the mean concentrations of Ni, Cd and Pb were in the 4 age categories Respectively: Nickel (78.55, 36.77, 34.65 and 25.61), cadmium (5.73, 4.55, 5.70 and 5.03), lead (21.74, 9.53, 8.26 and 8.10) micrograms per gram dry weight and The results showed that the mean concentrations of Ni, Cd and Pb were in the 3 longth group Respectively: Nickel (74.68, 35.61, 30.67), cadmium (5.65, 5.36, 4.76), lead (18.65, 9.52, 9.19) micrograms per gram dry weight that Lead and cadmium levels in 3 length categories and 4 age categories were higher than the standard limit EPA and FDA but The nickel content in 3 length categories and 4 age categories are less than standard. Since *Saccostrea cucllata* is oyster, eating it in any size can be dangerous to humans and other creatures of the consumer.

**Keywords:** Heavy metals, Loft Port, Pollution, *S.cucullata*.

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# Reduce the environmental impacts of rainbow trout ponds effluent by Biofloc technology

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Received: 07-Dec.-2013 Accepted: 08-Feb.-2015

## Abstract

Rainbow trout is the main spices in aquaculture production of Iran, which its effluent, containing organic materials, could alter natural situation of the ecosystem. Biofloc production could reduce the impacts of aquaculture effluent into the environment. In this study the Biofloc production was evaluate to reduce contamination of effluent to the natural resources. Four treatments each with triplicate were designed as control, molasses, sugar and equal combination of molasses and sugar. Two hundred grams of rainbow trout waste materials with six litters of ponds effluent transferred into the glass cone. Then the cones located in a place with constant temperature (25˚C) and continue aeration. After measuring the content of rainbow trout waste nitrogen the desired of carbohydrate calculated and added into the cones, respectively. Study was continued for 72 hours and during this time the nitrogen compounds of different treatments with the pH were measured and recorded daily. Results showed final form of nitrogen in control was nitrate and its level significantly ($P<0.05$) was higher than the other groups. Also, results indicated that in other groups the nitrate was absorbed by microorganisms and changed to Biofloc. We concluded that in Biofloc technology environmental contamination impacts of aquaculture effluent could reduce efficient by conversion of nitrogen compounds to Biofloc.

**Keywords:** Biofloc, effluent, nitrogen compounds, rainbow trout.

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# Comparing potential carbon sequestration of different parts of mountain almond and grape plants and soil in Fars Province

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Received: 12-Nov.-2013 Accepted: 15-Nov.-2014

## Abstract

Due to widespread areas of natural or manmade woodlands of mountain almond (*Amygdalus scoparia* Spach.) and extensive rainfed grape (*Vitis vinifera* L.), this study was conducted to compare between potential carbon sequestrations of these two shrubs in Fars province. Samples were taken from the whole biomass of both plants include above and underground parts and carbon sequestration rate of each organs was estimated using combustion method in laboratory. Also, potential carbon sequestration of the whole biomass, litter and soil at depths of 0-15, 15-30, 30-50 cm were estimated. Data of Plant parts, soils of understory and open spaces and different soil depths were analyzed using one-way ANOVA design and Duncan's test in SPSS software (ver.19). The results showed that there is a significant difference in carbon sink among different plant's parts (leaf, stem, trunk, root and litter) ($P<0.05$). Grape trunk and almond stem had the most potential in carbon sequestration. Almond soil showed more carbon accumulation than grape yard soil. Based on the results obtained, annual carbon sequestration capacity of mountain almond and grape was 5.88 and 30.55 kg $ha^{-1}$ and soil carbon sequestration of mountain almond and grape yard was 354.1 and 271.4 $tha^{-1}$ during 20 and 33 years respectively.

**Keywords:** biomass, carbon sequestration, grape, mountain almond, soil carbon.

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# Development of appropriate performance indicators for monitoring sustainability of Hyrcanian forest functions, north of Iran (Case study: Kheyrud forest)

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Received: 02-Jan.-2014 Accepted: 05-Mar.-2014

## Abstract

Sustainable forest function monitoring needs to develop appropriate forest functions and performance indicators to assist decision making, analyses and evaluation of sustainable forest functions. This study for first time generate a set of performance indicators for monitoring forest function as a case study for Kheyrud forest located on east of Nowshahr, Iran. The method of this study consists of three phases. In the first phase 77 indicators are developed for four forest functions including; forest production, forest conservation, forest protection and forest recreation, then this set of indicators are prioritized based on importance of binominal test. In second phase this set is prioritized based on difficulty of measurements on field. The result show, indicators are in two groups; more important indicators as a main indicator for sustainable forest functions and less important indicator as an alternative indicator for first group. In the last phase, all of indicators based on two aspects of importance and performance are mixed and divided in to four groups; less operational and less important, operational and less important, less operational and important, operational important. The final set is developed based on operatioanl and important indicators and is appropriate for sustainable monitoring of Northern forest functions in Iran.

**Keywords:** delphi method, hyrcanian forest, northern forest functions, sustainable forest functions indicators.

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# Effect of some physicochemical properties of sediment on Nickel and Vanadium concentration in sediments, roots, and leaves of mangroves

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Received: 17-Feb.-2013 Accepted: 24-Dec.-2014

## Abstract

Mangrove forests are of the most sensitive coastal ecosystems to oil pollution especially to Nickel and Vanadium bioaccumulation. The most important aim of the study was to compare the concentration of Nickel and Vanadium in sediments, mangrove roots and leaves in Nayband Marine National Park and Hara Protected Area in Qeshm Island; as well as to analyze the effects of physical and chemical parameters on these concentrations. So, the correlation between Nickel and Vanadium concentrations with sediment texture, EC, pH, and organic material were analyzed. The results showed that mean concentration of Nickel is higher than Vanadium in sediments and leaves of both habitats. It is also revealed that the mean concentration of both Nickel and Vanadium in sediments and roots in Nayband habitat are higher that those concentrations in Harra habitat which can be because of higher portion of soft texture in Harra habitat. However, the concentration of both Nickel and Vanadium in leaves in Nayband is much higher than of Harra habitat (about 2). This can have to explanations as: first, it might be because of more soluble Vanadium available for transferring to the leaves due to lower EC in Nayband sediments; second, higher exposure and absorption of vanadium from the air because of oil and gas activities in Nayband habitat. These findings are so concerning as usually the conservation, control, and monitoring plans are focused the habitats in vicinity of oil polluted areas but this research showed that also there are the other parameters more than distance-to-source controlling the accumulation of Nickel and Vanadium in mangrove habitats.

**Keywords:** Harra protected area, mangrove forests, Nayband Marine National Park, nickel, vanadium.

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# The role of geographic range metrics in determining national threat status of species (Case study: Anatidae in Iran)

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Received: 17-Feb.-2013 Accepted: 24-Dec.-2014

## Abstract

Geographic range metrics, important predictors of extinction risk, are commonly used in international and national red listing processes. Criterion B of IUCN Red List is based on these metrics, especially the Extent of Occurrence (EOO) and the Area of Occupancy (AOO). Inconsistencies in interpreting the two metrics and methods for calculating them have caused criterion B to be the most commonly misused among the Red List criteria. With an aim to introduce a nationally practical and repeatable method for calculating EOO and AOO, in this study these metrics were calculated for Anatidae in Iran. For calculating EOOs, distribution ranges were considered without exclusion of discontinuities and areas of unsuitable habitat. For calculating AOOs, since the scale of the present distribution maps (cell size of 25 km) differed from the IUCN reference scale (cell size of 2 km), scale correction factors (C) were used to determine AOOs in the reference scale. Of the 29 non-breeding and 14 breeding species we assessed, three breeding species have the potential to be classified under threatened categories based on EOO while 27 non-breeding and 14 breeding species have the potential to belong to threatened categories based on AOO. The methods used in this study clearly showed the differences in definition and purpose of EOO and AOO. Considering the scarcity of population data on wildlife species in Iran, which hampers the use of other Red List criteria, calculating EOOs and AOOs and assessing species based on criterion B can make the preparation of national red lists practicable.

**Keywords:** Anatidae, Area of Occupancy (AOO), Extent of Occurrence (EOO), IUCN red list, scale correction factor, threat assessment.

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# Environmental impacts assessment of compost plants using a Bayesian approach (Case study: Golestan Province)

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## Abstract

Composting as one of the municipal solid waste management strategies aims to reduce size and weight of excreted substances, to abate odor and leachate, increase resource recovery and reduce the cost of disposal. Environmental impact assessment (EIA) of compost plants is required for compliance with laws and regulations. EIA is one of the effective methods to protect environment. The aim of this study is environmental impact assessment of five candidate locations for compost plant and landfill in east and west of the Golestan Province. Considering new comprehensive and more objective methods of EIA can help improve the environment. In this study, the effects of compost plants on the environment of Golestan Province are evaluated in five sites. In the first step, the sites were visited and a GIS data base was compiled. Then, the maps of the potential environmental pollutions were generated in GIS for each site and relevant data extracted. The results of this part were entered into conditional probability table (CPT) of Bayesian network. Bayesian Belief Network is used in this study and is based on Bayes theory. The result of Bayesian network in each site was weighted with analytical hierarchy process (AHP) method. Then, technique for ordered preference of similarity to ideal solution (Topsis) was used to prioritize the sites. The results of this study showed that in eastern part of Golestan Province, site 2 and in the western part site 4 are the best. The results of this study confirm those of fuzzy matrix with compensating factor. Bayesian Belief network was found useful in EIA for entry of expert knowledge and display of the uncertainty in the status.

**Keywords:** AHP, compost, environmental impact assessment, expert judgments, Bayesian network, uncertainty.

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# Microbial status of groundwater Haraz River, Mazandaran Province

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Received: 14-Aug.-2013 Accepted: 26-Jan.-2015

## Abstract

Haraz River originates from the northern slopes of the Alborz and is flowed in a relatively broad valley. There are several village, sector, twenty sand factories and fish culture farms alongside of this river. In addition, restaurants and rest place for travelers sometimes used as a place. This study was performed to study the coliform contamination of ground water along the Haraz River. In this study, sixty samples were collected from groundwater during one year. The samples were examinated for total coliform and fecal coliform. The results showed that maximum and minimum of total coliforms in the ground water in Abask (4 CFU/100 ml) and Holomsar (1/9 CFU/100 ml) and maximum and minimum of fecal coliforms in Abask (1/2 CFU/ml) and Klode, Holomsar and Larijan (1/1CFU/100 ml), respectively. The results also showed that Haraz river ground water has been polluted and has low quality and is not suitable for drink and human consumption.

**Keywords:** bacteria contamination, coliform, groundwater, Haraz River.

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