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CONFERENCE PROCEEDINGS

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II. INTERNATIONAL CONFERENCE ON ECOLOGY, ECOSYSTEMS AND CLIMATE CHANGE

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CONTENTS

A CRITICAL VIEW THE PROTECTION OF THE ENVIRONMENTAL VALUES IN RURAL AREAS: WESTERN COAST SETTLEMENTS-KYRENIA

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1. Introduction

People need different building areas such as residential, commercial, industrial areas in order to sustain their lives. Most cities, that developed for society who are especially centered upon city centers, are experiencing environmental challenges such as poor air quality, water pollution, street noised and heat island effects which weaken the urban development process and environmental sustainability. In addition to these environmental problems, urban residents also complain against intensive work stress and less social communication among them both in individual and community level (Chen and Jim, 2008; Kweon et al., 1998). The rural landscape is a mosaic of natural and human managed land uses that vary in size, shape and arrangement (Zaizhi 1999).

In this scope, while constituting necessary building areas for vital activities within the planning, it is important the necessity of the protection of the ecological values, biodiversity in addition to pasture and agricultural areas that are especially needed in rural areas. However, the spreading of urban areas to rural areas by unplanned development causes socio-cultural comparisons as well as destruction of necessary ecological values to be preserved. In this scope, the structuring areas, that are constituting problem for many settlements, have an importance for regaining the lost ecological and socio-cultural values, and for living continuation.

From this point of view; it is necessary to determine a roadmap in the scope of necessary planning studies for the settlements that developed by spreading towards rural areas from urban.

In the creation of the roadmap, the ecological rural area effects of building dynamics and road layouts will be determined. In this direction, the comparative evaluation method will be used as a result of Swot analyzes (strong, weak, threats and opportunities) based on public views.

In the scope of the study, along with the Annan Plan in Cyprus island, the west rural area of north coastline (*Kayalar and Sadrazamköy*) where the structuring is intense, will be examined. In choosing these settlements, the idea of that ecological values of the western coast of the northern coastline were not too much destroyed, was effective. This study will demonstrate the necessity to provide priorities for the conservation of ecological, agriculture / animal husbandry and social values in the planning processes to be carried out in rural areas and in the methods and proposals to be followed in the building surroundings and road arrangements to be made. Thus, it is considered that this study is an important roadmap for present and future generations.

2. The Impact of Ecological and Environmental Values on Rural Areas

Rural areas where biodiversity is observed extensively. However, it is inevitable to face these areas as a problematic area with interventions made in line with human needs (such as mass housing, roadblocks ...). In this scope, observed habitat fragmentation, habitat destruction and their effects are revealed which were originated from urban areas growth towards rural areas.

2.1. Habitat Fragmentation and Biodiversity in Building Areas and Road Constructions

The construction of roads that needed as a result of urban spread to rural areas can potentially change the habitats of many wildlife creatures. Residential buildings are advantageous for sheltering, the roads are advantageous for travelling from one town to another. However, the road arrangements required for such structuring cause many of the species' original habitats to be diminished or completely lost.

So in this scope; urban, industrial, agricultural and similar field uses of rural areas are the most important reasons for the breakdown of natural habitats. The research shows that this process is spreading throughout the entire ecosystem (Haddad, et al., 2015) and has an increasing influence on the extinction of living species.

To this point of view, the fragmentation refers to the process of the open and natural areas turning into small and isolated units. In other words; habitat fragmentation is often defined as a process during which "a large expanse of habitat is transformed into a number of smaller patches of smaller total area, isolated from each other by a matrix of habitats unlike the original" (Wilcove et al. 1986). As the roads are directly influential in habitat fragmentation, they are also indirectly influential in both pollution that vehicles caused and in causing acceleration of recreation and settlement activities. At the same time, it significantly limits the mobility of many animal and plant species The fragmentation they caused, are causing to form smaller populations and to become more vulnerable to extinction. (Figure1)

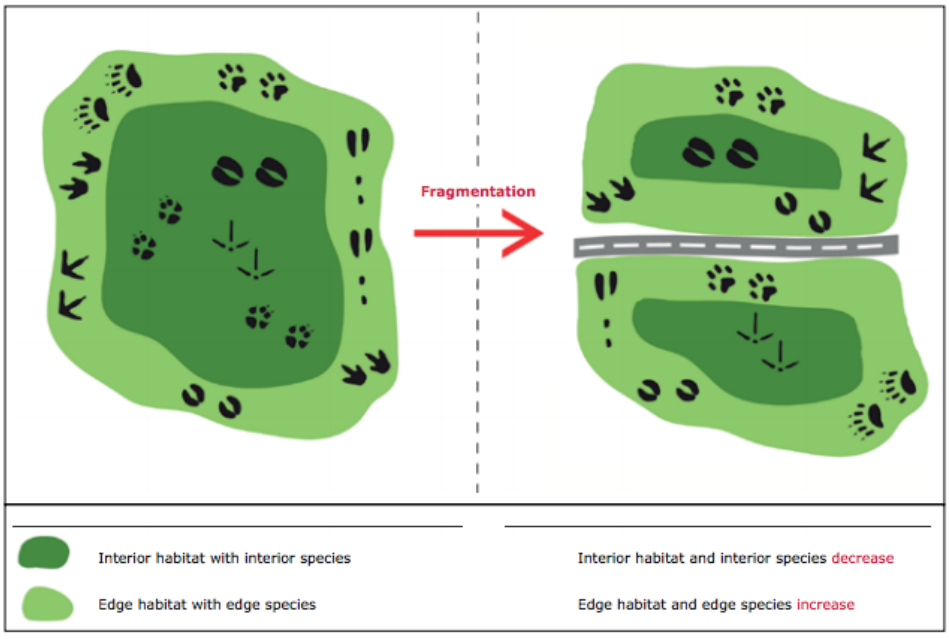

Figure 1.The decrease of interior habitat and species and increase of edge habitat and species as consequences of road construction fragmenting a habitat patch (European Environment Agency Copenhagen, 2011).

For example; animals either intentionally avoid roads or simply can not cross roads due to mortality during crossing attempts. Many natural habitats are isolated and greatly reduced in total area because of road development. Even though some of these areas would be preserved, most of them would not serve the same purpose to these native species once the damage has been done (Cheung and Weller, 2015).

It is important to indicate that, the material used in new built construction areas is important as well as the transformation of ecological natural areas to structuring areas and the habitat fragmentation. Especially, it is not right to ignore the damage that the commonly used concrete material gives to nature

2.2. Environmental Effects of Concrete Material in Structuring Areas and Habitat Destruction

Materials used in the scope of structuring areas and road arrangements have great importance. Generally, while contributing to the preservation of the biological environment in the building sites obtained by conventional methods and transferring them to future generations, there are great problems in the use of materials produced in the factories. Mainly the problem is, concrete material is consumed the largest quantity of nonrenewable materials, such as portland cement, aggregates, and water, of all the industries in the world. Obtaining these raw materials can damage a landscape, leaving deep pits or strip-mined hillsides. It can also produce massive erosion, harmful runoff, and habitat loss release dangerous pollutants into the environment (Simmons, 2011). (Figure:2) Another problem is that the concrete material does not contain gaps to allow flora and fauna to survive during the construction phase, such as traditional materials (stone, mud brick, etc.). (Figure:3)

Figure 2. Biodiversity lost in housing and surrounding area built with reinforced concrete material (Take by author, Akansu, V., 2016)

Figure 3. Biodiversity on residential buildings built with traditional materials and on the environment(Photo:Aydın, T., 2008)

Thus, it is observed that reinforcements constitute a barrier to the preservation and development of biological diversity. New constructions (residential, industrial, commercial buildings, etc.) made in these areas reveal that the natural habitat does not allow the shelter of existing species.

This situation is the result of habitat destruction which is a result of the rural area effects of urban expansion. Habitat destruction occurs when a natural habitat, such as a forest or wetland, is altered so dramatically that it no longer supports the species it originally sustained. Plant and animal populations are destroyed or displaced, leading to a loss of biodiversity (Laurance, 2010).

In concert with habitat loss, habitat fragmentation is a grave threat to species survival (Laurance et al. 2002; Sekercioglu et al. 2002). For this reason, the materials and land to be used in the construction sites to be built must be well chosen.

2.3. Socio-Cultural Effects of Structuring Areas

Socio-cultural assets are changing with the restructuring effects of the environment. These assets are the common remnants of civilizations as material cultural items defined due to the physical status of past to present, showing the cultural, social and economic values of the society which they belong, or the level of development (Gültekin, 2005). It is getting appearance by objectifying the material culture and moral culture items as buildings, techniques, roads, tools etc. (Bilgeseven, 2005). Just as in all human activities, natural environmental factors are also influential in housing construction (Zaman, 1995). It is known that different cultures living in the same or similar natural environments reveal different houses in form, plan and order by processing different building materials in different ways in the guiding of their own cultures within the possibilities of different perceptions and environments under the specific guidance of their own culture (Köse, 2005).

From this point of view, we can say that architectural materials and housing types have changed in the context of cultural influences changing in rural areas. It is observed that, especially the build-and-sell houses, that observed in rural areas as a result of urban sprawl, have developed completely towards factory production instead of more traditional materials. In brief, when rural areas begin to lose their existing cultural values, they gradually lose their building characteristics, and in addition to this they cannot avoid to threaten their ecological values.

3. Case Study- The west coast of Cyprus's northern coastline *(Kayalar ve Sadrazamköy)*

In the presentation of the study field data, along with the observation and interview, the data obtained from the urban and district planning department, geology and mining department and Cyprus Turkish Building Contractors were used. In this scope; *Kayalar and Sadrazamköy* traditional and new residential areas have been evaluated by SWOT analysis in ecological and cultural context.

3.1. The Built Environment in *Kayalar and Sadrazamköy* Settlements

Kayalar and Sadrazamköy are settlements where the Mediterranean climate vegetation Maki can be observed clearly, and which contains different samples of flora and fauna located to the west of the northern coastline of Cyprus island. The fact that it is dominated by mountain and sea view due to topographic settlement, is a sign that the idea of using it as a structuring area and its necessary natural areas to be protected, can be threatened. As a result of research, observation and interview that are thought to be effective in the protection of these problems;

- The people living in the region did not think of investing for many years and
- It is not preferred for constant living due to the distance to the city center.

On the basis of this thought, the structuring in the Cyprus island has been studied by many researchers as before and after 1974. Because until 1974, the people living as combined (Turkish Cypriots and Greek Cypriots) had to be divided as a result of political events. While the North Cyprus is under the Turkish government today, the Greek Cypriots keep living in South Cyprus with this

dividedness effect, people, who were brought to the island from Turkey after 1974, have settled to *Kayalar and Sadrazamköy* settlements. It has been observed that the dwellings are not transformed, but adapted by users without physical changes. This means that in *Kayalar* (Orga) village and *Sadrazamköy* (Liveras) there are no additions to existing house. In this user did not feel themselves temporarily settled in Cyprus. This concluded with no new constructions until the period (2003) when the Annan Plan was being discussed. In the result of the interview done these detections were made:

''We initially thought that were settled to Cyprus temporarily. While spending the money just enough to live in here, we sent rest of money to Turkey. We were buying land there for future investment. Even if we didn't make any addition to the housing we lived. We did not think we were permanent here. But they wanted from to stay here until our children have all grown and make our investment in this place. Thus, we sold the fields we owned in Turkey and we moved to better housing in there''.

While this was the situation in settlements, with the Annan Plan, mass housing was started to be produced by the increasing contracting companies in Cyprus (Hoşkara and Hoşkara, 2007).

However, the inadequacy of planning studies to ensure the regular development of the growing structure suggests that there may be difficulties in preserving ecological areas After 2003, the contractors' mass housing projects for build-and-sell architecture in *Kayalar and Sadrazamköy* settlements also affected the local and foreign investors due to the need for their love of nature and living away from the city. Especially in *Kayalar* settlement, in the scope of mass housing projects, it is observed that there is a settlement scheme which have more of a fullness in the summer season as a monthly rental method, on the other hand new residential areas are not used much in *Sadrazamköy*. In particular, the presence of unused residential areas in the region proves that ecological values have been irreversibly destroyed as an empty investment that does not serve for any reason.

When the current situation is examined, excessively destroying the ecological values of the region is prevented by preventing the intense structuring which due to the factors such as the lack of sufficient buyers for the houses built in these regions, the distance from the settlements to the city center, the inadequacy of public transportation, and the people mainly making living from husbandry. However, when there is a possibşe structuring, the necessity to preserve agriculture/husbandry, social and ecological values that observed in these areas is important.

3.2. Ecological Rural Region Effects of Building Dynamics and Road Arrangements

As a result of survey, observations and evaluations, *Kayalar and Sadrazamköy* rural settlements are in an important position in observing biodiversity in Cyprus island based upon keeping the geological, ecological and topographic features as well as mountain and sea habitat together. When the structuring situation of *Kayalar and Sadrazamköy* settlements are examined comparatively;

- In the *Kayalar* settlement, it is observed that the traditional settlement is concentrated in the center and the village development and the agricultural development area are located towards the periphery. An organic settlement is observed in this settlement.

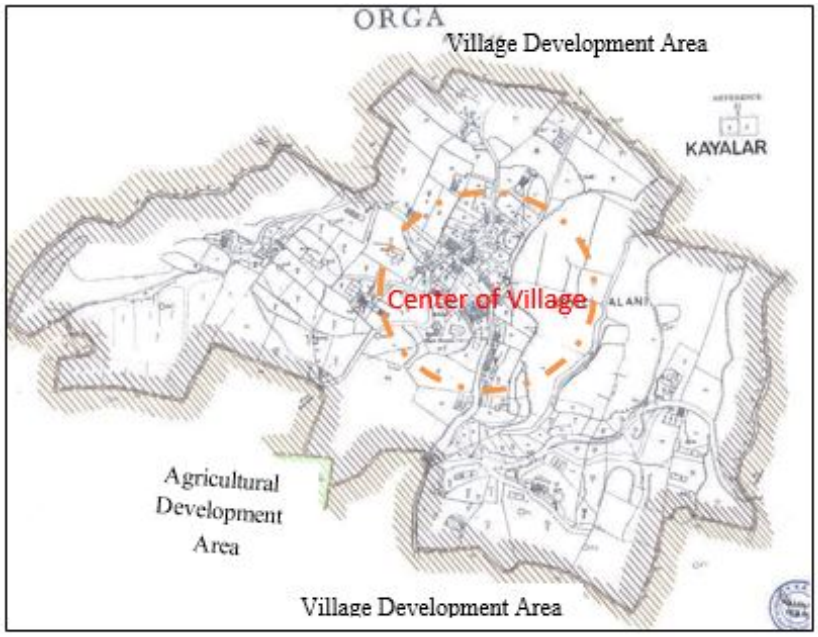

Figure 4. Village Development Area and New Structuring Context

- *In Kayalar and Sadrazamköy traditional housing areas, it has been observed that the houses are usually constructed from stone materials and the spaces between stone materials of garden walls are also capable of providing shelter for the living things. (Figure 5)*

Figure 5. Kayalar traditional residential area housing and street arrangements (Take by author, Akansu, V., 2016)

- Both in two settlements; it is observed that, houses in the village area of development are built from reinforced concrete material which does not provide opportunity for living. In the garden arrangements of these structures, the existence of stone walls and the protection of the soil area are effective in the formation of habitat suitable for increasing the living beings. (Figure 6)

Figure 6. View from the new residential region

- The difference observed in *Sadrazamköy* settlement and *Kayalar* settlement is; the observation of the linear settlement order in *Sadrazamköy* instead of the organic settlement order in *Kayalar*. This arrangement is revealed with locating the housed mostly in the two directions of the road. (Figure 7)

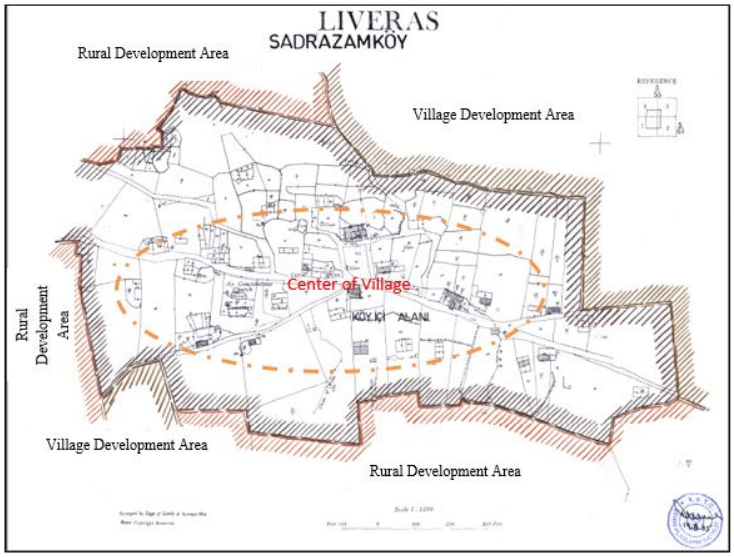

Figure 7. Village Development Area and New Structuring Context

In the *Kayalar and Sadrazamköy* settlements, which have similar characteristics, the use of reinforced concrete materials in new settlement areas causes the traditional touch to change. Also; it is observed that in the new residential areas differentiate in their culture due to the settlement of people with different cultures.

3.3. SWOT Analysis of Traditional and Newly Designed Residential Areas in Ecological and Socio-Cultural Context

In the scope of the study, the residences existing before 1974 are presented as traditional houses. The constructions built in by 2000's and especially the structures that the contractor companies produce as mass housing, are stated as new structuring areas in the study. The SWOT analysis of these areas, which is to be done in order to reveal the ecological and socio-cultural situation, is important. Identifying the strengths and weaknesses and the threats and opportunities in the region is important in bringing about the situation of the region.

Kayalar and Sadrazamköy Settlements Evaluations

		Ecological Status	Socio-Cultural Status
Strong	Traditional	The fact that they have been built with traditional materials has a positive effect on the development of flora and fauna.	The strength of neighborly relations in traditional residential areas.
	New	The use of traditional materials in the garden arrangements of the houses offers the opportunity to develop flora and fauna.	The traditional work of the people living in the region, the existence of the interaction that arises from the attraction of foreigners in the new residential area.
Weakness	Traditional	The use of reinforced concrete material in room additions and renovations that made to traditional residential areas	The fact that the people living in new residential areas are mostly from foreign countries and they cannot speak Turkish

	New	The fact that building from the reinforced concrete material generally negatively affects the formation of living spaces.	The fact that users in new residential areas do not know each other
Threats	Traditional	The fact that traditional material will eventually leave its place for new materials. (As, asphalt road while the road is actually stony, the presence of reinforced concrete modifications despite the fact that the houses are made of stone material, the filling of wasteland and new road needs ...)	Changing of the traditions over time due to pidginization of different cultured people in traditional and new residential areas.
	New	Increasing of roads and housing structures that will prevent the development of flora and fauna	The existence of different social life and cultures in new housing areas.
Opportunities	Traditional	The existence of time, allowing potential for planning studies and taking long years to make additions and renovation for the houses	The people who lead up to miles for their needs in terms of shopping and job opportunities for many years
	New	Giving place of the rapid structuring period of new residential areas to a slowly developing rural resettlements.	The existence of reorganization potential of the region with measures to be taken for the protection of culture and social structure.

Table 1. Ecological and socio-cultural assessment in the context of SWOT analysis of housing in traditional and new planning regions

The result of the SWOT analysis for *Kayalar and Sadrazamköy* shows that settlements show similar progress. It supports the strengths that are still among the places that can be preserved due to the ecological and cultural characteristics of the regions. It also provides opportunities for protection and transfer to future generations. However, the fact that the regions have begun to concretion poses a threat to the living conditions as well as a significant disadvantage for the region.

It cannot be said that there are many planning studies to protect these regions which are observed to have high ecological values. It is revealed that the regions that are tried to be planned with random, autonomous decisions, will lose all of their rural characteristics and integrate with suburban and urban areas if the measures are not taken.

3.4. Environmental Impact Assessment of Buildings and Road Regulations in *Kayalar and Sadrazamköy* Rural Settlement Plans

Kayalar and Sadrazamköy settlements are important ecological settlements unique to Cyprus that belongs to mountain and marine ecosystem which features natural vegetation. However, the coastal strip, which is opened for construction day by day, negatively affects the topographic and geological features as well as the biological diversity. Agricultural and pasture lands in the region are now transformed into settlement areas. In the context of this situation; it is inevitable that new road arrangements and the necessary regulations for the infrastructure to be formed.

In addition to lively life, hosted on a parcel that is opened for construction, the arrangements made within the framework of infrastructure and road arrangements which necessary for these lands also cause the destruction of hectare area as well. Thus the habitat fragmentation which is caused by road arrangements that necessary for constructed buildings and habitat destructed houses, damages the biodiversity and cause the loss of many species.

In this direction; the planning studies which are considered to be inadequate in the region, reveal the necessity of being revised by considering the cultural and ecological values by a commission which the public will participate as well as the related institutions and organizations. Because, if precautions are not taken, the ecological values, living populations and cultural values that rural areas excessively have, will decrease and disappear over time. Loss of these values will prevent the continuity of living's life.

The built environment, which is one of the most important threats to the conservation of biological diversity, is developing as a part of build-and-sell architecture without considering human needs with the aim of providing economical gain and autonomous decisions. If this problem is not overcome, the biggest problems will come to the agenda in the upcoming years.

Conclusion

Increasing structuring in the world and in our country due to the effect of urban spreading has significant risks to living organisms in the environment. Countries that are particularly inadequate in their planning efforts are also having difficulties to protect biological diversity and transfer it to future generations.

To overcome this situation, the urban areas, rural development areas and agricultural lands must be separated from each other in the planning works. Furthermore, the relevant organizations should continuously update and implement the regulations that have protective effects on the ecological values of the planning studies which will be created with the participation of public and government units.

Otherwise, the constructions that the constructors have built without considering individual need, number of households and customer potential in order to make a profit and infrastructure arrangements to be made in order to provide transformation to these constructions, will greatly damage the habitats.

References

Bilgeseven, Â.K., 2005. ''Türk Milletinin Manevi Değerleri'', Atatürk Supreme Council Atatürk Culture Center Publication:332, ''Türk Kültüründen Görüntüler Dizisi:76'', Ankara, p.2.

Chen, W.Y. and Jim, C.Y. 2008. "Assess and valuation of the ecosystem services provided by urban forests", in Carreiro, M.M., Song, Y.C. and Wu, J. (Eds), Ecology, Planning, and Management of Urban Forests: International Perspectives, Springer, New York, NY, pp. 53-83.

Cheung, M. and Weller, O. 2015. 'Are Roads and highways killing Snakes Because of Habitat Fragmentation?'Conservation of Endangered and Threatened snakes in Ontario. http://pleasebrakeforsnakes.blogspot.com.cy/2015/11/roads-and-highways-killing-snakes.html

European Environmental Agency Copenhagen 2011. 'Landscape fragmentation in Europe' Joint EEA-FOEN Report.

Gültekin N.T, 2005. ''Geleneksel Kentsel Konut ve Dokusunun Yeniden Kazanımı, Şehircilik Çalışmaları,'' Nobel Academic Publishing Ankara, p.385.

Haddad, N.M, Brudvig, L.A.; Clobert, j.; Davies, K.F.;Gonzalez, A.; Holt, R.D.; Lovejoy, T.E.; Sexton, J.O.; Austin, M.P.; Collins, C.D.; Cook, W.M.; Damschen, E.I.; Ewers, R.M.; Foster, B.L.; Jenkins, C.N.; King, A.J.; Laurance, W.F.; Levey, D.J.; Margules, C.R.; Brett A. Melbourne, B.A; Nicholls, A. O; Orrock, J.L; SongD. and Townshen, J.R. 2015. 'Habitat Fragmentation and Its Lasting Impact on Earth's Ecosystems'. Science Advance, Vol. 1, no: 2, March 2015.

Hoşkara, Ş. and Hoşkara, E., 2007. ''Annan Planı Sonrasında Kuzey Kıbrıs'ta İnşaat Sektörüne, Mimarlık ve Planlamaya Eleştirel bir Bakış'', Journal of Architecture issue:334.

Köse, A. 2005. "Türkiye'de Geleneksel Kırsal Konut Plânlarında Göçebe Türk İzleri", Afyon Kocatepe University Journal of Social Sciences, 7(2), Afyon, p.167.

Kweon, B. S.; Sullivan, W. C. And Wiley, A.R, 1998. ''Green Common Spaces and the Social Integration of Inner-City Older Adults''. Environment and Behavior Sage Journals,Vol:30, Issue:6, pp:832-858.

Laurance, W. F., Lovejoy, T., Vasconcelos, H., et al. 2002. Ecosystem decay of Amazonian forest fragments: a 22- year investigation. Conservation Biology, 16, pp.605–618.

Laurance, W.F. 2010. Habitat destruction death by a thousand cuts. Sodhi and Ehrlich: Conservation Biology, Oxford University Press, chapter 4, Pp.73-87.

Sekercioglu C. H., Ehrlich, P. R., Daily, G. C., Aygen, D., Goehring, D., and Sandi, R. 2002. Disappearance of insectivorous birds from tropical forest fragments. Proceedings of the National Academy of Sciences of the United States of America, 99, pp.263–267.

Simmons, H. L. 2011. Olin's construction:Principles, materials and methods, ninth editions. John Wiley&Sons, Inc., New Jersey-Canada.

Wilcove DS, McLellan CH, Dobson AP. 1986. Habitat fragmentation in the temperate zone. In Conservation Biology, ed. ME Soul´e, pp. 237–56. Sunderland, MA: Sinauer

Zaizhi, Z. 1999. Landscape change in a rural area in China, Landscape and Urban Planning 47 (1-2), 1-9.

Zaman, M., 1995. "Tonya (Trabzon) İlçe Merkezinde Mesken Tipleri", Doğu Coğrafya Dergisi, V.I, Issue:1, Erzurum, p.499.

FRAGMENTATION IN THE IN-SITU CONSERVATION OF LAKE NAKURU NATIONAL PARK, KENYA

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Abstract

This paper examines the outlook and consequences of governance fragmentation in the conservation of strictly protected area, Lake Nakuru National Park. We illustrate the existing institutional gaps in the conservation of wildlife and wetlands and research. Although the Park has been recognized internationally as a Ramsar site and UNESCO World Heritage site, the Kenya Wildlife Service has not sufficiently conserved/rehabilitated fragile Lake Nakuru wetland. Fragmentation arising from in-situ conservation is largely attributed to the organizational structure of the Kenya Wildlife Service that is highly militarized to protect wildlife but barely organized for scientific wetlands conservation.

Keywords: Governance Fragmentation, Lake Nakuru National Park, Ramsar site, UNESCO World Heritage site, Wetlands, Wildlife Conservation

1. Introduction

The trans-boundary nature of many environmental problems necessitates the need for collective actions among stakeholders (Buzbee, 2003), but actual implementation actions have not been so well coordinated. Multilateral environmental agreements that many leaders have strongly emphasized have not shown drastic improvement in facilitating trans-boundary or integrated approaches; rather, these agreements seem to have caused governance fragmentation (Kanie, 2014; Ivanova, 2007; Scott, 2011). There are, for instance, about 155 biodiversity related conventions (Najam et al., 2006). This tends to overwhelm implementing institutions particularly in developing countries (Kanie, 2014 and Najam et al., 2006).

In his study on environmental governance in western Canada, Matsui (2012) observed that intra-disciplinary or intra-jurisdictional nature of academic works on water issues and federal-provincial divisive water bureaucracy have contributed to disintegrating knowledge on water governance into areas of biodiversity, traditional knowledge and Native rights, although these are interconnected in many ways.

Similar conditions have affected effective water conservation in Kenya. For instance, water management of the Mau Catchment has been divided into agencies that are responsible for forest conservation, hydropower licensing, water quality control, water allocation, timber harvest, flood protection, forest fires, wildlife protection (KWTA, 2016).

Some scholars have suggested that fragmentation can provide both benefits and hurdles. O'Connell (2006) posits that institutional fragmentation reduces the "group-think" tendency and promotes diversity of ideas and approaches. Institutional separation encourages specialization that ultimately develops innovative ideas and better techniques (Ibid; Doremus, 2009).

On the other hand, fragmentation can act as a stumbling block to resolving environmental disputes (Doremus, 2009). In a complex and interconnected ecosystem, the challenge with institutional fragmentation makes planning incomprehensive and myopic. The cumulative impacts originating from disparate agency activities unlikely widen gaps (Buzbee, 2003).

Given this wicked nature of fragmentation, case studies may provide scholars better opportunities to illustrate the outlook and consequences of governance fragmentation. Having done extensive researches on wildlife management, wetland conservation, and national park policies in Kenya and Canada, we find it important to examine governance fragmentation in Kenya.

This paper, therefore, focuses on Lake Nakuru National Park, which has experienced overlapping governance, such as wetland conservation, species protection, water catchment management, among others (KWTA, 2016). By disentangling these webs, we attempt to clarify the possible outlook of institutional synergy or cooperation mechanism.

Since the Park is a strictly protected area, we examine fragmentation that arises from on-site (in-situ) management of the Park and its ecosystems. Here we specifically look at administrative fragmentation within the Park in the conservation of wildlife, Lake Nakuru and research work. Since the Kenya Wildlife Service (KWS) solely manages the Park we examined its organizational structure and inter-departmental collaboration.

2. Lake Nakuru National Park

Lake Nakuru National Park is located between 0^0 24'S and 35^0 05'E in the Rift Valley of Kenya (Figure 1). The Park is situated within Nakuru municipality, approximately 3 kilometers south of Nakuru town (Gichuhi, 2008; Odada et al., 2006). It is surrounded by electric fences. This park mainly exists for wildlife protection and tourism promotion.

Lake Nakuru area was established as a conservation area in 1957, a bird sanctuary in 1960 to protect flamingoes, and as a national park in 1961. At the time, the Park's size was only around 40 km^2. Through a World Wildlife Fund led initiative, from 1964 to 1972, the Park size was expanded to 188 km^2 to create a buffer zone between Park's wildlife and human population (Odada et al., 2006).

The Park has been critical in protecting endangered species and preventing wildlife crimes. For instance, it is home to Rothschild giraffe, one of endangered species introduced in 1977. Due to the rampant poaching in the 1970s and the early 1980s, black and white rhinoceros were brought into the Park in 1987 (Raini, 2009; Odaba et al., 2006). The Park is now home to 450 bird species, including about 850,000 flamingoes (Nasirwa, 2000), 56 mammal species, several geological features, and 550 plant species (savanna vegetation) (KWS, 2017). It is one of the most visited parks in Kenya, with about 245,000 tourists per year (Nyunja, 2012). Due to its importance, it received international

recognition as a Ramsar site in 1990, an Important Bird and Biodiversity Area in 1999 and, as a UNESCO World Heritage site in 2011 (UNESCO, 2017).

Despite its importance, the Lake has experienced some critical challenges, including water level fluctuations, water pollution, wildlife conservation, deforestation, and conflicting interests between conservationists and agriculturalists. It is a closed lake with a shallow basin and high salinity (Nyunja, 2012). High evaporation and low precipitation have contributed to the alkalinity, as this area is rich in alkaline minerals. Its water sources are from permanent Baharini springs and five seasonal rivers (Njoro, Nderit, Makalia, Naishi and Larmudiak). The underground water inflow into the lake is minimal since it lies 1,759 meters above sea level (Gichuhi, 2008)

Over the years, the lake has experienced drastic fluctuation of water levels that affected wildlife habitats. Most recently (2013), the lake experienced rapid water level rise that increased lake's surface area from 27% to 40% of the national park. This flooding inundated the Park's main gate area, nearby office blocks, and some parts of the road (Moturi, 2015). It reduced alkalinity and hampered the growth of algae that thousands of flamingoes feed on. As a result, a large number of flamingoes left the Lake. Also, the habitat and grazing land for herbivores have been reduced. Afforestation and deforestation activities in the Mau Catchment, from which four of the above five seasonal rivers originate, affect the amount of water and silts to run into the Lake (Moturi, 2015).

In addition, industrial and domestic waste discharges have polluted the Lake largely because of urbanization and population increase in Nakuru town, coupled with ineffective waste management. The increased uses of agrochemicals by farmers upstream have also contaminated the Lake (Gichuhi, 2008).

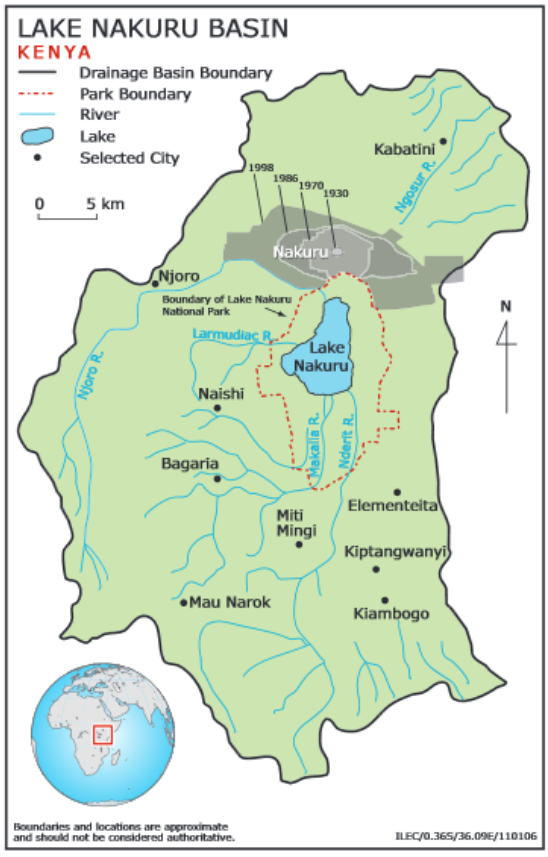

Figure 1. Lake Nakuru Catchment Area

Source: Odada et al. (2006)

3. Methodology

This research is based on document content analysis and interviews with key officials to determine the status and impacts of fragmentation in governing Lake Nakuru National Park. In clarifying fragmented governance, we reviewed national laws, policies and strategic plans that are administered under relevant agencies, such as the Kenya Wildlife Service (KWS). As the management of natural resources affects Lake Nakuru governance, we examined KWS's organizational structure and the Wildlife Conservation and Management Act (2013). We also examined Lake Nakuru National Park advertisement brochures produced by the KWS.

To understand the KWS structure and clarify fragmented conditions, we conducted interviews in December 2016. We interviewed key KWS officials who were in charge of wildlife management, research, wetlands protection, forestry, and tourism in both head office and Nakuru offices. Our interviews also sought to understand the level of inter-departmental and inter-agencies collaboration and existing research sharing techniques. We further investigated in the field to see how the Ramsar and World Heritage Conventions have been incorporated in the conservation activities at the Park.

4. Results

4.1 Gaps in Wildlife and Wetland Conservation and Tourism Promotion

In short, we found that the KWS has not promoted institutional synergy. The KWS organizational structure has largely contributed to this problem. The KWS was established to protect, conserve and manage wildlife (Wildlife Conservation and Management Act, 2013). From interviews we found that, although KWS management has helped protect wildlife inside the Park, it has struggled to sustainably conserve the Lake Nakuru ecosystem. The KWS Nakuru branch did not have personnel in charge of wetlands.

This has also been reflected on tourism promotion, which is the main source of revenues for the Park. Tourism promotion is wildlife-based and rarely connected with wetland and heritage conservation initiatives. In promoting tours, the KWS has not taken advantage of the Park being the Ramsar and UNESCO World Heritage site even though the KWS is the focal point for the Ramsar Convention implementation (KWS, 2017). Lake Nakuru National Park promotion brochures that the KWS headquarters (Nairobi) has distributed do not contain any information about the international recognition of the Park. Most of tourism activities are organized by numerous private safari companies that mainly offer a full day trip package to the Park (African Spice Safaris, 2017; AfricanMecca Safaris, 2017; Go Kenya Tours and Safaris, 2016).

Somewhat reminiscent of a military base, the Park is hedged with a 74km electric fence supposedly to make it easier to monitor activities and better protect wildlife from poachers or other intruders. Self-automated solar power grids are used to back-up power outage. At all times, an officer is responsible for checking and manning 4km-long fenced section on the Park. The KWS game rangers regularly patrol and report to an area warden who then reports to the park warden. The daily communication is usually done with VHF (very high frequency) radios. The Park has no wildlife veterinarian. The

nearest KWS veterinary hospital is located in Naivasha (roughly 62km away). The rangers are trained to detect the animal sickness.

The militarization and exclusivity of the KWS management have impeded public participation in the protection of wildlife inside the Park even though the Ramsar Convention calls for public participation in the sustainable use of wetlands (Resolution XII.9; Resolution VIII.36). Armed rangers sometimes intimidate the local residents. Those rangers have been granted the right to kill suspected poachers. The KWS rangers have been accused of extrajudicial killing, enforced disappearance and torture of detained suspects (Bryant and Shabibi, 2017; The Star, 2015). However, at the best of our knowledge, no such cases have been reported in areas surrounding Lake Nakuru National Park.

In fact, the Ramsar Convention ratification has not been important part of KWS tasks. Instead, the National Museums of Kenya has been responsible for the communication, capacity building, education, participation, and awareness (CEPA) program of the Ramsar Convention (National Museums of Kenya, 2017; Karanja et al., 2017). Nonetheless, the National Museums' access to the Park has been very limited by the KWS, which mandates the Museum to obtain an access permit. The Wildlife Clubs of Kenya located inside the Park conduct conservation awareness activities and training. The Clubs have educated high school students in the past.

4.2 Research

The way research has been done at Lake Nakuru National Park also tells how institutional synergies are needed. The KWS has a research division, but it is underfunded and under-staffed. As of December 2016, the KWS Nakuru office had only three researchers who are responsible for conducting research on all issues related to the Park, including animal censuses, wildlife conservation, wetland protection, tourism, waste management, forestry, human-wildlife conflicts, and water quality. Given the diverse areas that the researchers are supposed to cover and their limited number, some research areas and/or issues are neglected. This eventually hinders effective planning and conservation of the Park.

The internal research sharing mechanism is not well coordinated. The research findings rarely trick down to rangers and other implementers. Our interviews revealed that the formulation of management plans hardly take into account research findings. This is partly due to communication disconnect between research division and planners partly due to exclusion of researchers in the planning phase.

To conduct research in Kenya, a research permit from the National Commission for Science, Technology and Innovation (NACOSTI) is required (NACOSTI, 2017). For outsiders to conduct research at the Park, an additional research permit from the KWS is needed (Wildlife Conservation and Management Act, 2013). The KWS research permit requires non-KWS staff (whether individuals or organizations) to submit their research findings to the headquarters. It was observed that only about 40% of the researchers comply. The research division is expected to monitor and promote research sharing, but no established mechanism to do so.

5. Discussion

The Ramsar and World Heritage Conventions have not substantially influenced wetlands conservation and tourism policies at Lake Nakuru National Park. This is despite the strong emphasis by the National

Environment Policy (2013) to “promote domestication, coordination and maximization of benefit from strategic multilateral environment agreements.” The low contributions of the two Conventions can partly be attributed to miscommunication or fragmented decision-making between wildlife, wetlands, and tourism departments of the KWS.

The KWS has limited capacity for wetlands management. The implementation of the Ramsar Convention has been the sole responsibility of the KWS headquarters in Nairobi. This makes it harder to monitor in the field. With the designation of Lake Nakuru National Park as the first Ramsar site in Kenya, the KWS by default became the national focal point for the implementation of the Convention.

The limited impact of the two conventions can also be attributed to inadequate research sharing mechanisms. The KWS, unlike other well-established conservation national agencies, does not have a research institute. For instance, the Kenya Forest Service has the Kenya Forestry Research Institute, which is an independent state corporation responsible for undertaking research on forestry (Forest Conservation and Management Act, 2016). The KWS researchers are not only outnumbered and overwhelmed by research issues but also operate with limited funds and research equipment. The KWS research division mandate is not very clear. The management plans are rarely guided by scientific findings. The establishment of the Kenya Wildlife Research and Training Institute, as suggested by the Wildlife Conservation and Management Act (2013), can help overcome some of these challenges.

There is also a fragmentation in sharing research findings within and across agencies. Researches conducted by non-KWS researchers are compiled and stored at the KWS headquarters. This limits the accessibility of research work. A well-established online portal can harmonize this fragmentation and make it easier for KWS staff to share and access research findings. The lead agencies need to examine the importance of organizing regular wildlife and wetlands conferences to disseminate and share ideas. Special invitations should be extended to relatively recent authorized researchers. Publication of presented conference papers in the portal ought to be given a consideration. This will probably increase researcher submission compliance rate.

6. Conclusion

This research has found that administrative fragmentations inhibit sustainable ecosystem management at Lake Nakuru National Park. The fragmentations arises largely from inter-departmental communication disconnects. This has hampered sharing of research findings within the Kenya Wildlife Service. Although tourism is the major revenue source for the Kenya Wildlife Service, the Service has not fully exploited available opportunities. The wetland (Lake Nakuru) protection and research have been sidelined.

Acknowledgement

We wish to extend our greatest appreciation to the Kenya Wildlife Service for giving us license to carry out this research in Lake Nakuru National Park. Thank you to the Service head office and Nakuru branch for providing us with relevant data and information to support this research. We pass our gratitude to their staff for sharing their experiences, ideas and opinions that strengthened this research.

References

African Spice Safaris (2017). 3 Days/2 Nights Lake Nakuru National Park Safari. http://www.africanspicesafaris.com/lake_nakuru_national_park_3_days_safari_2_nights.html. Access date. July 10, 2017

AfricanMecca Safaris (2017). Lake Nakuru Safari and Tour. http://www.africanmeccasafaris.com/travel-guide/kenya/parks-reserves/lake-nakuru/tours-safari. Access date: July 10, 2017

Bryant B. & Shabibi N. (2017). Revealed: The Deadly Cost of Defending Elephants from Ivory Poachers. Vice. https://www.vice.com/en_au/article/4xpb5d/revealed-the-deadly-cost-of-defending-elephants-from-ivory-poachers. July 10, 2017

Buzbee, W. W. (2003). Recognizing the regulatory commons: a theory of regulatory gaps. Iowa L. Rev., 89, 1.

Cook, C. (2014). Governing jurisdictional fragmentation: Tracing patterns of water governance in Ontario, Canada. Geoforum, 56, 192-200.

Crowder, L. B., Osherenko, G., Young, O. R., Airamé, S., Norse, E. A., Baron, N., ... & Langdon, S. J. (2006). Resolving mismatches in US ocean governance. *SCIENCE-NEW YORK THEN WASHINGTON-*, *313*(5787), 617.

Doremus, H. (2009). CALFED and the quest for optimal institutional fragmentation. *environmental science & policy*, *12*(6), 729-732.

Folke, C., Hahn, T., Olsson, P., & Norberg, J. (2005). Adaptive governance of social-ecological systems. *Annu. Rev. Environ. Resour.*, *30*, 441-473.

Forest Conservation and Management Act. (2016). 677. Kenya Gazette Supplement No. 155 (Acts No. 34)

Gichuhi, M. W. (2008). Ecological Management of Lake Nakuru Catchment Area. In *Proceedings of Taal2007: The 12th World Lake Conference* (Vol. 960, p. 964).

Go Kenya Tours and Safaris (2016). Day Trip-Lake Nakuru National Park-Kenya Safari Packages. http://www.gokenyasafari.com/nairobi-safaris/1daylakenakuru.html. Access date: July 10, 2017

Ivanova, M. (2007). Institutional Fragmentation and Normative Compromise in Global Environmental Governance: What prospects for Re-Embedding?

Kanie, N. (2014). Governance with Multilateral Environmental Agreements: A Healthy or Ill-equipped Fragmentation? *Green Planet Blues: Critical Perspectives on Global Environmental Politics*, 137.

Karanja, J. M., Matsui, K., & Saito, O. Problems of public participation in the Ramsar CEPA programme at the Tana Delta, Kenya. Wetlands Ecology and Management, 1-11.

KWS (2017). Lake Nakuru National Park: Attractions. http://www.kws.go.ke/lake-nakuru-national-park. Access date: April 3, 2017

KWTA (2016). Kenya Water Towers Agency strategic plan 2016-2020.

Matsui, K. (2012). Water Ethics for First Nations and Biodiversity in Western Canada. International Indigenous Policy Journal, 3(3).

Moturi N. F. (2015). A Hydrological Study on the Rising Water Level at Lake Nakuru. The University of Nairobi

NACOSTI (2017). National Commission for Science, Technology and Science. Research Permits. https://oris.nacosti.go.ke/index.php. Access date: May 24, 2017

Najam, A., Papa, M., & Taiyab, N. (2006). Global environmental governance: A reform agenda. International Institute for Sustainable Development, Manitoba, Canada. ISBN 1-895536-91-x

National Museums of Kenya (2017). Marine and Wetland Section. http://www.museums.or.ke/marine-and-wetland-section/. Access date: May 23, 2017

National Environment Policy (2013). Republic of Kenya

Nasirwa, O. (2000). Conservation status of flamingos in Kenya. Waterbirds: The International Journal of Waterbird Biology, 47-51.

Nyunja J. (2012). Wetland Tourism: Kenya-Lake Nakuru. 11th Conference of parties for the Ramsar Convention. http://www.ramsar.org/sites/default/files/documents/pdf/case_studies_tourism/Kenya/Kenya_EN.pdf

O'Connell, A. J. (2006). The architecture of smart intelligence: structuring and overseeing agencies in the post-9/11 world. California Law Review, 94(6), 1655-1744.

Odada E. O., Raini J. & Ndetei R. (2006). Lake Nakuru: Experience and Lessons Learned Brief. http://www.worldlakes.org/uploads/18_Lake_Nakuru_27February2006.pdf

Raini, J. A. (2009). Impact of land use changes on water resources and biodiversity of Lake Nakuru catchment basin, Kenya. African Journal of Ecology, 47(s1), 39-45.

Resolution VIII.36. Participatory Environmental Management (PEM) as a tool for management and wise use of wetlands. 8th Meeting of the Conference of the Contracting Parties to the Wetlands Convention (Ramsar, Iran, 1971) Valencia, Spain, 18-26 November 2002. http://www.ramsar.org/sites/default/files/documents/pdf/res/key_res_viii_36_e.pdf

Resolution XII.9. The Ramsar Convention's Programme on communication, capacity building, education, participation and awareness (CEPA) 2016-2024. 12th Meeting of the Conference of the Parties to the Convention on Wetlands (Ramsar, Iran, 1971). Punta del Este, Uruguay, 1-9 June 2015.

Scott, K. N. (2011). International environmental governance: managing fragmentation through institutional connection. Melb. J. Int'l L., 12, 177.

The Star (2015). Doyo accuses KWS of killing four in Isiolo. May 21. http://www.the-star.co.ke/news/2015/05/21/doyo-accuses-kws-of-killing-four-in-isiolo_c1139049. Access date: July 10, 207

UNESCO (2017). Lake Nakuru National Park. http://whc.unesco.org/en/tentativelists/1344/. Access date: April 18, 2017

Wildlife Conservation and Management Act. (2013). 1236. Kenya Gazette Supplement No. 181 (Acts No. 47).

ENVIRONMENT FRIENDLY TECHNOLOGY: ORGANIC RANKINE CYCLE (ORC) ENERGY RECOVERY SYSTEM BASED ON A ECO-FRIENDLY WORKING FLUID

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Abstract

In this paper, the benefits of Organic Rankine Cycle (ORC) system for environment and thus for the ecosystem is explained generally. Organic Rankine Cycle (ORC) is a rather environmentally friendly system as it utilizes waste heat to produce electrical energy as an energy recovery system which is favourable for ecosystem. The aim of ORC technology is waste heat recovery which is crucial phenomenon for environment as waste heat is regained and recycled not to pollute the nature. An ORC system basically consists of a condenser, a pump, an evaporator and a turbine with a generator. This structure enable the ORC system waste haet recovery producing electricity at low temperature levels ranging between 60 and 200°C which cause low efficiency about generally between 10% and 20%, depending on the low temperature levels and the availability of a suitably matched fluid. An Organic Rankine Cycle (ORC) resembles to a conventional steam power plant, apart from the working fluid, which is an organic, high molecular mass fluid with a liquid-vapor phase change, or boiling point, at a lower temperature than the water-steam phase change. In terms of green energy significantly required for our ecosystem, ORC can also take a part with not only its energy recovery but also its connection with renewable energy systems such as solar, geothermal, wind and etc.

n-Pentane known as the environment-friendly working fluid, is utilized in this sudy as the working fluid of this environment-friendly ORC system. And then, this ORC system with n-Pentane was examined within this study with an analysis through 1D engineering software.

Keywords: Organic Rankine Cycle, ORC, energy recovery system, environment friendly, eco-friendly, nature friendly, low grade heat source, energy system, ORC system

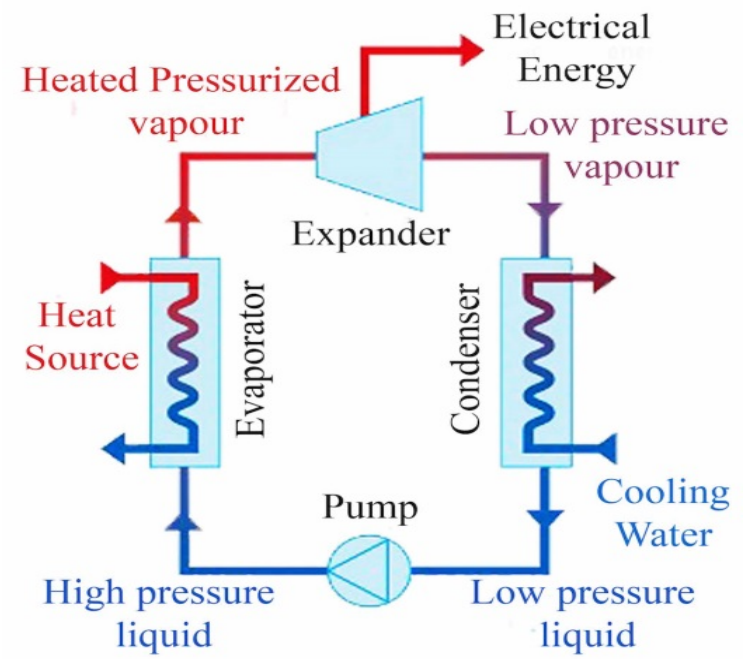
Organic Rankine Cycle (ORC) Energy Recovery System

Organic Rankine Cycle (ORC) is an energy recovery system which is environment friendly. As energy recovery from low temperature heat sources are actualized and waste heat is recycled, this system is beneficial for nature and environment. This low temperature heat sources for ORC ranges between 70 and 200°C. ORC is alike to traditional steam power plant and the Clausius Rankine Cycle except the

organic working fluid and the lower temperature levels as the organic working fluid has higher vapor pressure and lower boiling point than water. ORC can also be ideal for small size applications compared to a steam power plant [1,2].

Structure of ORC systems are developed as the turbomachinery consisting turbines, generators, condensers and evaporators. This structure provide transformation of thermal energy of waste heat from possible various sources such as exhaust gas turbines, internal combustion engines, geothermal sources, large melting furnaces, biomass, solar, etc. into mechanical shaft power which converts into electrical energy [3].

Properties of the chosen organic working fluid has a crucial effect on the performance of the ORC system. Thus, appropriate thermodynamic properties of the working fluid can result in more efficient cycle performance and low costs. Accordingly, the organic working fluid n-Pentane is chosen in this study due to not only its appropriate thermodynamic properties but also its environment-friendly structure [4,5].



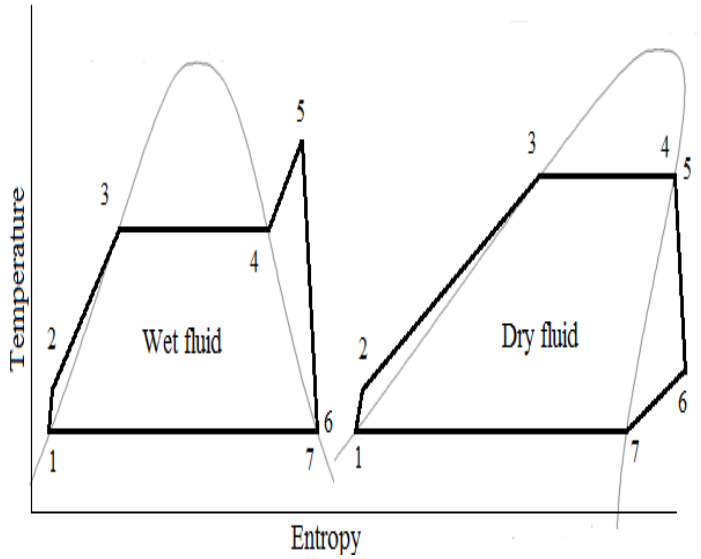


Figure 1. ORC system diagram showing working of ORC unit and temperature-entropy diagram of ORC

As illustrated in the Figure 1, ORC system consists of a pump, evaporator, condenser, turbine and a generator basically. Liquid working fluid at the outlet of the condenser is led to the evaporator via a working fluid pump (1-2); and it attains heat from the heat source and changes into saturated or superheated vapor in the evaporator (2-5). Then the vapor bleeds into the turbine (5-6) and actuates a generator to produce electricity. The low pressure exited vapor from the turbine outlet is cooled and condensed to liquid in the condenser (6-1), which finalizes the cycle. Corresponding T-s diagram is demonstrated in Figure 1 for both wet fluids which means turbine outlet is saturated and dry fluids which means turbine inlet is saturated [6,7].

Benefits Of ORC Energy Recovery System For Environment

ORC Energy Recovery System, as being waste heat recoverer, is rather beneficial for environent and therefore it is nature friendly technology as illustrated in Figure 2. Additionally, the further advantages of ORC system is its compact, small size and simple structure at low cost, applicable existing Technologies, high safety, low maintenance, easing power burden, no emissions of exhaust gases such as CO, CO2, NOX and other atmospheric pollutants since ORC consumes virtually no additional fuel which means it is environment friendly. Moreover, the exhaust heat exiting from ORC could be used to drive chillers as absorption chillers to supply cooling capacity. Utilization of various kinds of heat sources when low-grade heat sources are used for power generation is another advantage of ORC technology [8,9].

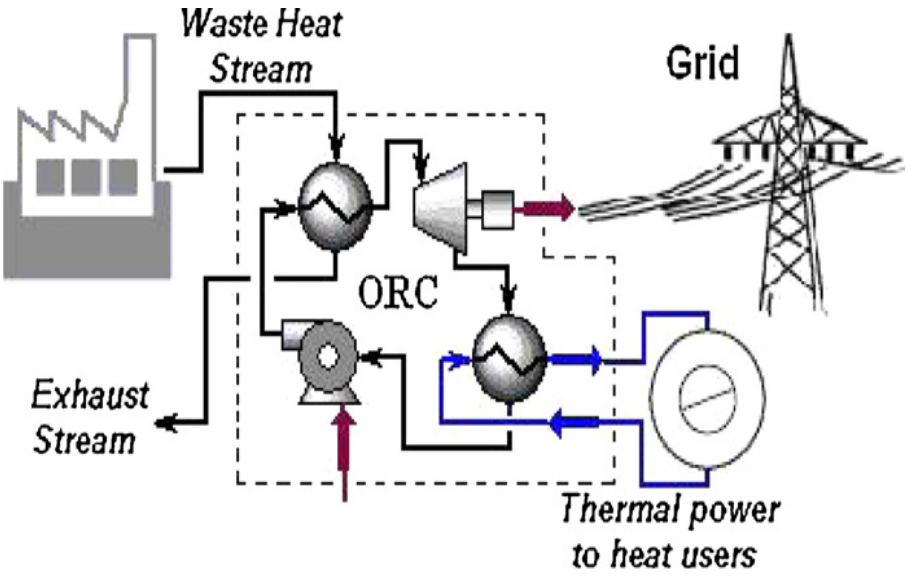


Figure 2. Sketch showing waste heat stream usage and electrical energy producing

Fluid Selection For ORC Energy Recovery System

Fluid selection for ORC system design is rather crucial phenomena for environment friendly concept due to the properties and effects of the fluids against nature. Especially, global warming potential

(GWP) and ozone depletion potential (ODP) values of working fluids directly influence ecology. Therefore, n-Pentane as the environment friendly organic fluid is selected for this study [10,11].

The Ideal organic working fluid general characteristics for selection are high molecular weight, high critical pressure and temperature in order to allow the engine operating temperature to absorb all heat available up to that temperature; low operating pressure in order to avoid explosion or rupture and avoid negative impact on the reliability of cycle; small specific volume, in its gaseous state, to avoid need for large and costly turbines, evaporators, and condensers; higher pressure inside condenser in order to prevent air inflow into the system; non-flammable, noncorrosive or nontoxic characteristics and stable [11,12].

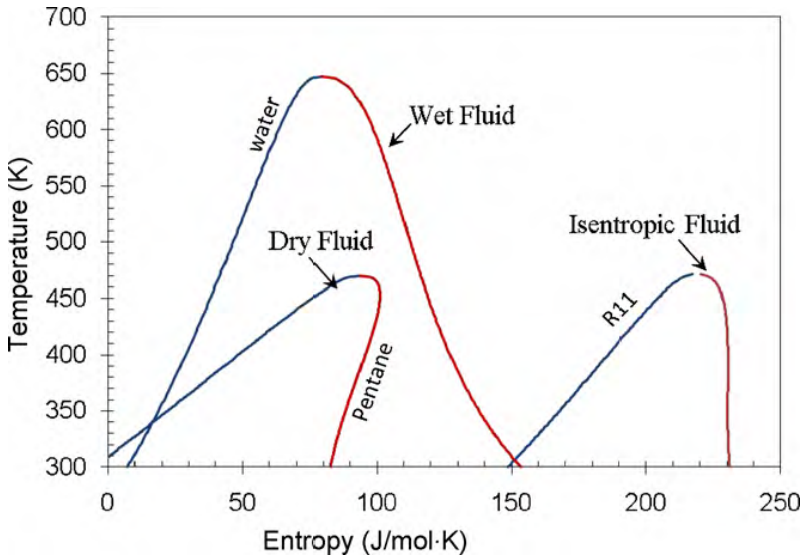


Figure 3. Temperature-entropy diagram of three types of working fluids: dry, isentropic, and wet

Fluid selection should be based on environmental safety data, due to struggeling against major environmental problems related to ozone layer depletion and global warming. Moreover, fluid selection will affect both energy economy as well as operational and environmental safeties. Therefore, n-pentane was selected for this study as it has these properties of: zero ODP, GWP is less than 150 (European Union regulations), low normal boiling point, critical temperature is such that the fluid should be suitable for subcritical cycle operation for considered operating condition and higher auto-ignition temperature than heat source temperature for thermal stability [13,14].

Analysis Of n-Pentane Fluided ORC System

The simulation study of the ORC system using n-Pentane organic fluid is carried out with the engineering programme. n-Pentane is used as the working organic fluid since it is the new generation, efficient, low GWP and low ODP organic fluid with favorable specifications for environment. According to the temperature and pressure values we entered to the programme, calculations were carried out by the programme. Thus, the ORC system with n-Pentane organic fluid was analyzed with 1D engineering programme coding. Accordingly, the T-S diagram in the Figure 3 was plotted throughout the coding performed. Thus, the calculations below were also obtained for n-Pentane fluided ORC system from the engineering programme [15].

Table 1. Results for n-Pentane working fluided ORC system

Unit Settings: [Kj]/[C]/[kPa]/[kg]/[degrees]		
a_1 = 10000 [kPa]	δh = 54,25	$\eta_{II,boiler}$ = - 0,8438
$\eta_{II,condenser}$ = 0,4672	$\eta_{II,pump}$ = 0,008051	$\eta_{II,system}$ = 0,2417
$\eta_{II,turbine}$ = 0,7342	η_{pump} = 0,85	$\eta_{pump,isentropic}$ = 0,8
η_{th} = 0,06085	$\eta_{turbine}$ = 0,8	$\eta_{turbine,isentropic}$ = 0,9
$E_{Q,boiler}$ = 16,86	$E_{Q,p}$ = 0	h_0 = 361,6 [kJ/kg]
h_{2s} = -124 [kJ/kg]	h_{4s} = 485,4 [kJ/kg]	h_5 = 2547 [kJ/kg]
h_6 = 2556 [kJ/kg]	I_k = 1661	I_{boiler} = 18,86
I_{con} = -7,817	$I_{condenser}$=7,817	I_{pump}=0,2629
I_{top}= 1690	$I_{turbine}$=1,571	m=0,1 [kg]
m_h= 0,01	p_0=1	P_5=1
P_6=1	Q_{kazan}=66,96	$Q_{condenser}$=61,54
R$='n-pentane'	SP=0,01068	s_0=1,697 [kJ/kg-K]
s_{2s}=-0,4558	s_{4s}=1,889	s_5=9,09 [kJ/kg-K]
s_6=9,122 [kJ/kg-K]	T_0=21	T_{4s}=89,92 [C]
T_5=25	T_6=30	T_{boiler}=393,2
$T_{çevre}$=294,2	W_{net}=4,075	W_{pump}=0,265
$W_{turbine}$=4,34	x_{2s}=-100	x_{4s}=100
x_6=100		
Calculation time=,0 sec		

Table 2. Arrays table for n-Pentane fluided ORC

	1 e_i	2 h_i [kj/kg]	3 P_i	4 s_i	5 T_i [C]	6 V_i [m^3/kg]	7 x_i
1	147,7	-124	5	-0,4558	-30,27	0,001502	0
2	147,7	-123,9	20	-0,4558	-30,26	0,001502	-100
3	127,7	545,7	20	1,889	120	2,257	100
4	68,59	491,4	5	1,905	45	8,431	100
5	-2153						
6	-2162						

According to these results taken from the coding calculations, T-S diagram below for n-Pentane working fluided ORC was also taken from the programme

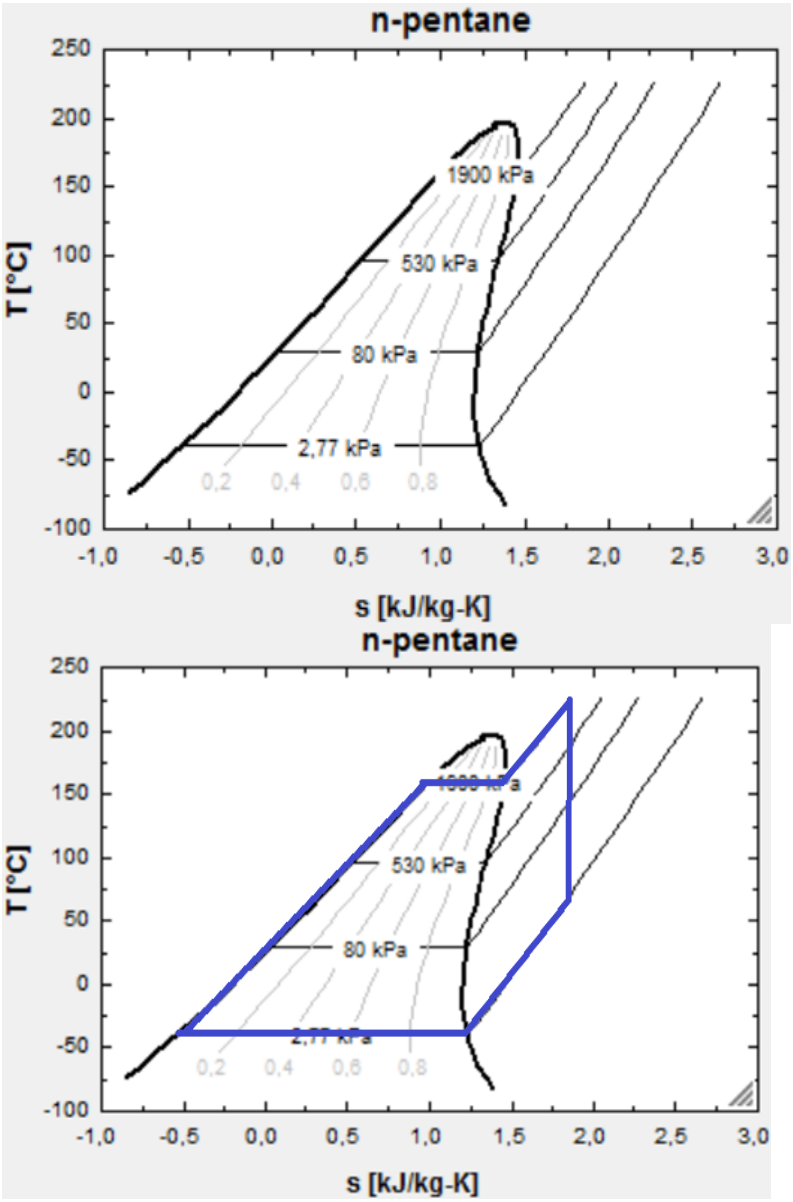


Figure 4. T-s diagram for n-Pentane working fluided ORC

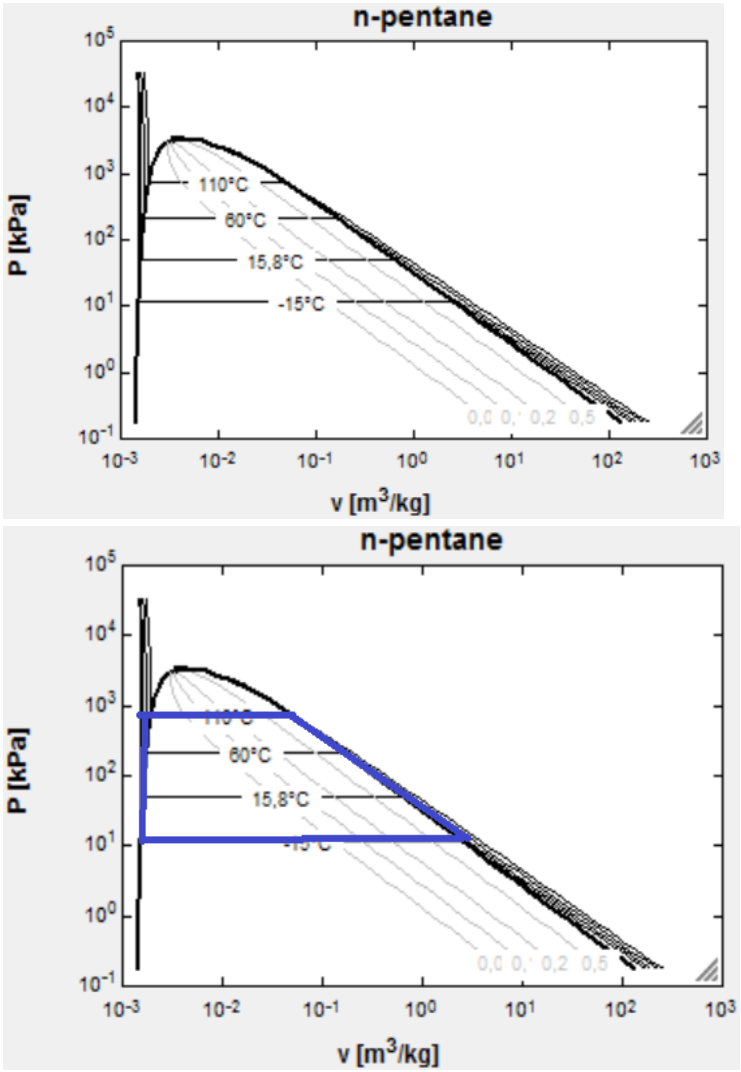


Figure 5. P-v diagram for n-Pentane working fluided ORC

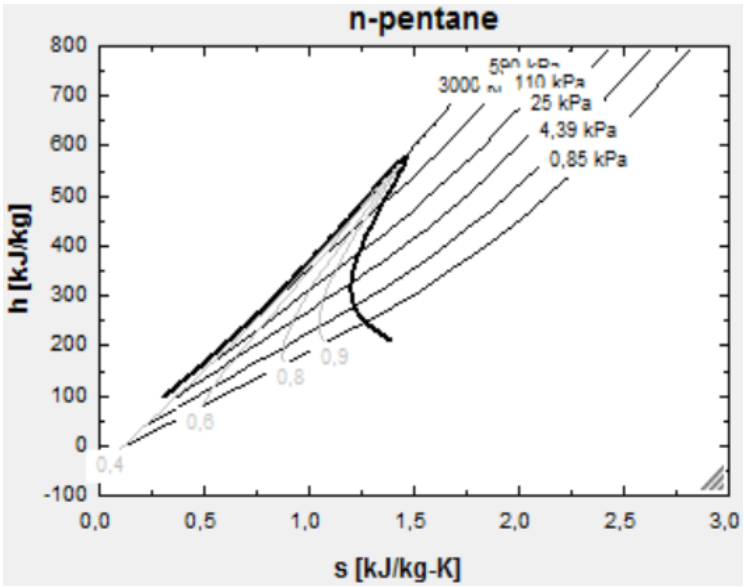


Figure 6. h-s diagram for n-Pentane working fluided ORC

Phase change of n-Pentane is in the desired region and its T-s curve slopes inward on the gaseous side as demonstrated in Figure 4 due to the shape of the T-s diagram. The graphs with inlet pressures of 10 and 20 bar have been included in Figure 5 to give a representation of the range of system efficiencies that are available. Figure 6 demonstrates that n-pentane is capable of reaching high efficiencies. The fluid can get larger pressure ratios and system efficiencies to the upper range of 15-16%. The disadvantage is the higher vaporization temperatures that must be exceeded by additional energy. The closed loop pre-heater configuration joints additional six percents to the overall efficiency. The advantages of the pre-heater are slight at lower pressure ratios. There is a steady gain from the regular closed loop cycle and the superheated configuration.

CONCLUSIONS

In this study, an investigation of an analysis of ORC system design with environment friendly fluid n-Pentane is carried out in order to verify ecological benefits for nature. Its recovery of low heat energy as well as its electrical energy production are the crucial benefits of ORC system for ambient. The thermo-interaction between ORC system components yields to energy retrieval. The organic fluid used in ORC system is very effective in its performance. Thus, in this study, the new generation organic fluid n-pentane is utilized to calculate the ORC system performance through the 1D engineering programme calculations. When n-pentane was chosen from the programme library as the used organic fluid, the related calculations were performed according to thermal energy and exergy values. Thus, the T-s, P-v and h-s diagrams were plotted and beheld correspondingly. As a result, n-Pentane can be evaluated as well suited for ORC system as a new generation nature compatible organic fluid.

Environment friendly n-Pentane, as having low ODP and low GDP values, is rather good in terms of thermal efficiency, heat transfer requirement and net power generation. For given temperature range, n-pentane is processed at rather low pressure level. n-Pentane profits high thermal efficiency. Furthermore, n-Pentane has low working pressure which causes various advantages in safety. And the absence of any higher strength materials requirement of n-Pentane during the operation of system design inclines to lower system cost. The heat transfer area requirement is low for n-Pentane providing the compact heat exchanger. n-Pentane profits high net work output and low heat transfer requirement in spite of high turbine size. Generally, n-Pentane is providing the best arrangement among the different performance metrics. n-pentane profits lowest heat transfer requirement and highest turbine size parameter. Additionally, n-pentane with highest critical temperature yields lowest heat transfer requirement and highest size parameter.

REFERENCES

[1] Bonalumi, D., Bombarda, P., Invernizzi, C., 2017. “Potential performance of environmental friendly application of ORC and flash technology in geothermal power plants”, Energy Procedia, 129, 621-628

[2] Lecompte, S. 2015. “Review of organic Rankine cycle (ORC) architectures for waste heat recovery”, Renewable and Sustainable Energy Reviews, 47, 448-461

[3] Chen, H., Goswami, Y., Stefanakos, E. 2010. “A review of thermodynamic cycles and working fluids for the conversion of low-grade heat”, Renewable and Sustainable Energy Reviews, 14, 3059–3067

[4] Panesar, A., Morgan, R., Kennaird, D. 2017. “Organic Rankine cycle thermal architecture – From concept to demonstration”, Applied Thermal Engineering, Vol. 126, 419-428

[5] Desai, N. 2016. “Thermo-economic analysis and selection of working fluid for solar organic Rankine cycle”, Applied Thermal Engineering, Vol. 95, 471-481

[6] Liu, B., Chien, K., Wang, C. 2004. “Effect of working fluids on organic Rankine cycle for waste heat recovery”, Energy, Vol. 29, Issue 8, 1207-1217

[7] Dong, S. 2016. “Optimum design method of Organic Rankine Cycle system based on semi-empirical model and experimental validation”, Energy Conversion and Management, 108, 85-95

[8] Sarkar, J. 2016. “Comprehensive Study on the Role of Eco-Friendly Working Fluid Properties on ORC Performances”, International Journal of Thermodynamics, Vol. 19, 4, 198-204

[9] Hærvig, J. 2016. “Guidelines for optimal selection of working fluid for an organic Rankine cycle in relation to waste heat recovery”, Energy, 96, 592-602

[10] Cignitti, S., Andreasen, J. G., Haglind, F., Woodley, J. M., Abildskov, J. 2017. “Integrated working fluid-thermodynamic cycle design of organic Rankine cycle power systems for waste heat recovery”, Applied Energy, 203, 442-453

[11] Liu, L., Zhu, T., Ma J., 2017. “Working fluid charge oriented off-design modeling of a small scale Organic Rankine Cycle system”, Energy Conversion and Management, Vol. 148, 944-953

[12] Vélez, F. 2014. “Selecting working fluids in an organic Rankine cycle for power generation from low temperature heat sources”, DYNA 81, 188, 173-180

[13] Tartière, T., Astolfi, M. 2017. “A World Overview of the Organic Rankine Cycle Market”, Energy Procedia, 129, 2-9

[14] Imran, M., Haglind, F., Asim, M., Alvi, J. Z. 2018. “Recent research trends in organic Rankine cycle technology: A bibliometric approach”, Renewable and Sustainable Energy Reviews, Volume 81, Part 1, 552-562

[15] Molésa, F., Navarro-Esbría, J., Perisa, B., Mota-Babilonia, A., Barragán-Cerveraa, Á., Kontomaris, K. 2017. “Thermo-economic evaluation of low global warming potential alternatives to HFC-245fa in Organic Rankine Cycles”, Energy Procedia, 142, 1199–1205

ORGANIC VITICULTURE

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ABSTRACT: Protection of ecological equilibrium is necessary for all living life. The environmental conditions that form the ecological balance are closely related to plant, animal and human health. However, due to environmental pollution and the decrease of natural resources, the ecological system is affected negatively. Factors such as urbanization, rapid population growth, industrialization, agricultural fertilizers and agricultural chemicals increase environmental pollution and human health is effected adversely. For this reason, the healthy lifestyle is gaining more importance in the world and in our country in recent years. Organic nutrition for this purpose, It has become necessary. Increasing the consumption of organic products is compulsory to avoid harmful effects of chemical substances. Ecological elements have been damaged since years due to conventional agriculture. Organic growing is one of the ways to minimize this loss. With the increase of environmental consciousness, organic farming is being carried out in every area of agriculture for a long time. Organic viniculture is one of these areas. Organically grown table grape and seedless grape production is demanded highly by consumer. Owing to organic viniculture, our natural resources can be used efficiently, ecosystem balance can be preserved, environmental pollution can be reduced and nutrition with organic products can be provided for healthy life. The use of organic agriculture as an effective means of sustainability of our living resources is at the forefront, and it is becoming compulsory for individuals and societies to take measures to protect nature.

Keywords: Organic viticulture, ecological balance, environmental pollution, healthy nutrition.

INTRODUCTION

Life style is an important factor on health. According to WHO, 60% of the relevant factors related to the health and quality of life of an individual are related to lifestyle. Millions of people live an unhealthy lifestyle. For this reason, metabolic diseases, arthrosis and skeletal problems, cardiovascular diseases, hypertension, overweight and other problems can lead to an unhealthy lifestyle. The relationship between lifestyle and health is of great importance. According to current research, life style has an important influence on human's physical and mental health. Reorganization of this unhealthy lifestyle is a preventive factor to reduce the speed of genetic diseases. When we look at existing studies in the health field, nine key factors for a healthy lifestyle can be suggested (Figure 1).

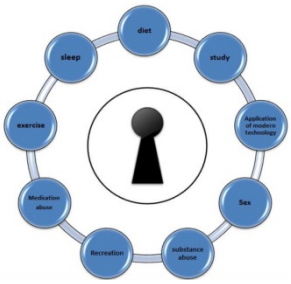

Figure 1. Nine important factors that constitute a healthy lifestyle (Farhud, 2015).

The sources of environmental pollution and diseases that cause pollution vary from country to country. The level of national income and development are the critical factors responsible for these changes. Chronic diseases seen in countries with high incidence are leukemia with nervous growth disturbances such as asthma, dyslexia, mental retardation, hyperactivity. Childhood obesity and type 2 diabetes have doubled between the years 1980-2012. The most important diseases seen in adults in these countries are apoplexy, heart, cancer, diabetes and chronic lung diseases. In countries with low and middle income groups, air pollution and contamination of drinking water are the most important environmental risk factors that cause disease. Malnutrition, parasites and vector-borne diseases are a major threat to human health. Toxic chemicals and pesticides are the most important sources of environmental contamination in countries with high incidence. Chemical and pesticide pollution has also increased in countries with low and middle income groups. Children who are unable to find clean drinking water and are exposed to unbalanced nutrition are more affected than adults. The most important acute diseases caused by environmental pollution are pneumonia and diarrheal disease. Diseases caused by pollution are causing great economic costs in countries. Due to environmental pollution around the world, 7 million people die every year due to health problems (HIV / AIDS, malaria and tuberculosis). Pollution control strategies and technologies should be developed by countries in order to avoid environmental pollution. (Suk et al., 2016).

The cause of chemical pollution in the ground is urbanization. But agriculture, especially viticulture, does not cause negative effects on the soil. The increase in the number of grape producers is due to environmental conditions and the introduction of appropriate agricultural activities. In France, the number of organic vineyard increased by 110% in 2001 to 28,190 ha from 13. 426 ha. Although organic viticulture is considered as healthy grape production, it also reduces the harmful effects of agriculture on the environment, especially on the soil. In addition, organic producers use organic pesticides instead of synthetic pesticides and fertilizers. Particularly used copper in place of synthetic pesticides. (Coll, 2012) Chemical contaminants accumulate in body fat tissues and cause toxic effect. These pollutants, which cause many harmful effects, cause both coronary heart disease and vascular disease as well as myocardial infarction (Ha et al., 2007).

Healthy living is one of the most important factors that make the economy stronger. It also affects business productivity, labor supply and human resources (Trzpiot and Orwat-Acedanska, 2016).

Producers and consumers in many countries, especially in developed countries with high income levels, have started to produce clean products that do not harm the natural balance, pollute the environment, do not toxic to humans. The production system realized for this purpose is called 'ecological agriculture'. 'Biological agriculture' and 'Ecological agriculture' are used synonymously. (Köse and Odabaş, 2005)

The most important threat for conventional and organic agriculture is the problems brought about by plant diseases in agriculture. The most important in organic viticulture is the most resistant variety to diseases. For this reason, organic production is one of the most important criteria for choosing the most suitable variety (Draginci et al., 2015).

Today, organic viticulture is increasing all over the world. The reason for the attraction of organic products is due to people's food safety, health and environmental conditions. Organic viticulture began in 1950s thanks to the pioneering countries Germany and Switzerland. At present, organic viticulture is an important part of the European Union organic agriculture sector. Although organic production still has a small share when compared to conventional production, it is present in all countries of the European Union (Draginci et al., 2015). Organic viticulture is common in countries such as Italy, France and Spain, especially in Europe.

World Organic Agriculture Activities are given in Figure 2. The regions with the largest areas of organically managed agricultural land are Oceania (22.8 million hectares or 45 percent of the global organic farmland), Europe (12.7 million hectares or 25 percent of the global organic farmland) and Latin America (6.8 million hectares or 15 percent). The countries with the most organic agricultural land are Australia (22.7 million hectares), Argentina (3.1 million hectares) and the United States (2.0 million hectares).

On a global level, the organic agricultural land area increased by 6.5 million hectares compared with with 2014. The highest shares of organic agricultural land are in Liechtenstein (30.2 percent) and Austria (21.3 percent).

There were almost 2.4 million producers and the countries with the highest numbers of producers are India, Ethiopia and Mexico.

The market research company Organic Monitor estimates the global market for organic food to have reached 81.6 billion US dollars in 2015 (approximately 75 billion euros). The United States is the leading market with 35.9 billion euros, followed by Germany (8.6 billion euros), France (5.5 billion euros), and China (4.7 billion euros). In 2015, most of the major markets showed double-digit growth rates The highest per capita spending was in Switzerland (262 Euros), and Denmark has the highest organic market share (8.4 percent of the total food market) (Fibl. Org., 2017).

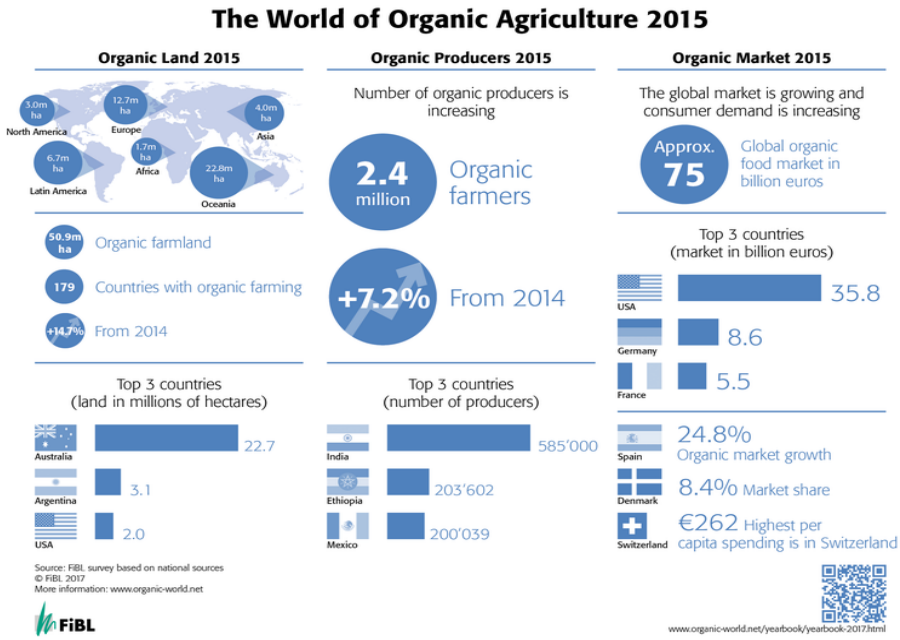

Figure 2. The World of Organic Agriculture 2015 (Fibl.org, 2017)

Organic Market in Europe

The organic market in Europe continues to grow. In 2015, it increased by 13% and nearly reached 30 billion euros (European Union: 27.1 billion Euros). Almost all the major markets enjoyed double-digit growth rates.Farmland increased by 8 %. Germany is the largest organic market in Europe (8.6 billion euros), followed by France (5.5 billion euros), the UK (2.6 billion euros) and Italy (2.3 billion euros) (2015 data). The first figures available for 2016 show that the market continues to grow (Germany 2016: 9.5 billion euros). Globally, Germany is the second largest market after the U.S. (35.8 billion euros in 2015).

The trend of the market growing faster than organic farmland continued in 2015. However, it is encouraging that the area of organic farmland grew at a faster rate than it had in past years: it increased by almost one million hectares or by 8.2%. At the end of 2015, 12.7 million hectares were under organic management in Europe (in the European Union, 11.2 million hectares). This constitutes 2.5% 6.2% respectively of the total agricultural land. The countries with the largest organic farmland areas are Spain (1.97 million hectares), Italy (1.49 million hectares) and France (1.37 million hectares). In each of these three countries, the area of organic farmland increased by at least 100’000 hectares. Nine European countries report that at least 10 % of their farmland is organic and the highest organic shares worldwide are in Liechtenstein (30.2 %), Austria (21.3 %) and Sweden (16.9 %) (Fibl.org., 2017).

For the year 2015, the organic farmland of the continents and the regions share of the global organic agricultural land are shown in Table 1. Organic farming in the area of 22,838,513 ha of Oceanside is located in 1 place. 12,716,969 hectares of organic farming are done in Europe, which is in the second place in terms of area, and Latin America is located in the 3rd place with organic agriculture made in the area of 6,744,722 hectares.

Table 1. World: Organic agricultural land and regions shares of the global organic agricultural land 2015.

Region	**Organic agricultural land (hectares)**	**Regions shares of the global organic agricultural land**
Africa	*1.683.482*	*3%*
Asia	3.965.289	8%
Europe	12.716.969	25%
Latin America	6.744.722	13%
North America	2.973.886	6%
Oceania	22.838.513	45%
Total	***50.929.006***	*100%*

Source: FIBL.org.,2017.

It is seen in Table 2 that the first country in terms of organic farming area is Australia (2.690.000 ha). 2. The next country is Argentina with an area of 3.073.412 ha. The next country is the United States of America with 2.029.327 ha organic farming area. According to these figures, the organic farming area in our country is 486.069 hectares, as seen in Table 2.

Table 2. World: Organic agricultural land and regions shares of the global organic agricultural land 2015.

Country	Hectares
Australia	22.690.000
Argentina	3.073.412
United States of America	2.029.327
Spain	1.968.570
China	1.609.928
Italy	1.492.579
France	1.375.328
Uruguay	1.307.421
India	1.180.000
Germany	1.088.838
Canada	944.558
Brazil	750.000
Mexico	584.093
Poland	580.731
Austria	553.570
Sweeden	518.983
United Kingdom	495.929
Turkey	486.069
Czech Republic	478.033

Source: FIBL survey 2017.

When we examine Figure 3, we see the distribution of organic producers. It is observed that the largest number of organic producers is in Asia (35%), Africa is in the 2nd place (30%) and Latin America (% 19) is in 3rd place.

When the countries are examined, it is seen that the highest number of organic producers (585.200 persons) is in India (Figure 4). Subsequent Ethiopia has 203,602 organic producers. In the third place, there are 200,039 organic producers in Mexico City. The number of organic producers in our country is 69. 967 people.

Figure 3. Distribution of organic producers by region 2015.

Source: FIBL survey 2017.

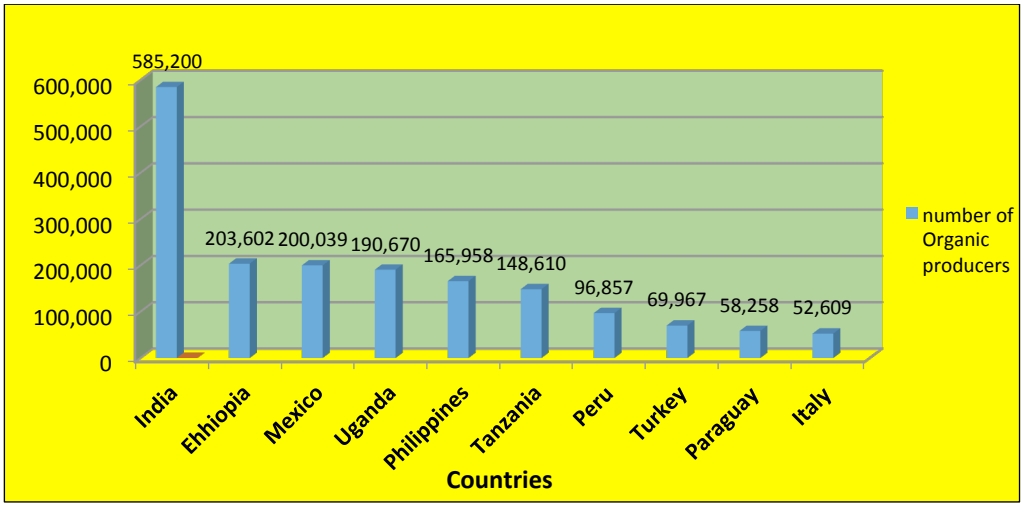

Figure 4. The ten countries with the largest numbers of organic producers by region 2015.

Source: FIBL survey 2017.

According to Figure 5, we can see that most of the coffee, olives and hazelnuts are grown according to the distribution of organic grown products. Tropical and subtropical fruits are followed by organic grape production. According to the year 2015, grapes were cultivated in an organic area of 311,866 hectares.

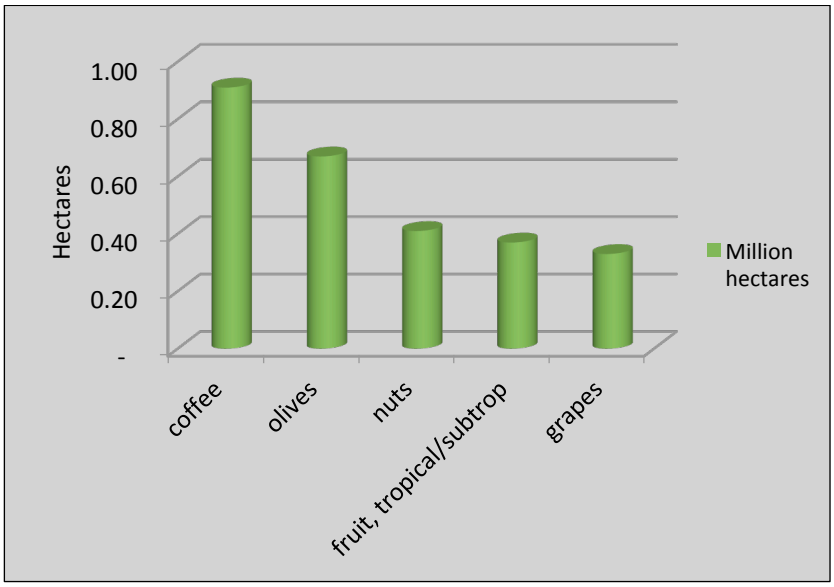

Figure 5. Global market: Distribution of crop categories 2015.

Source: FIBL survey 2017.

Figure 6 shows that most of the organic grape cultivation is done in Europe. It is the Asian and North American continent that follows it.

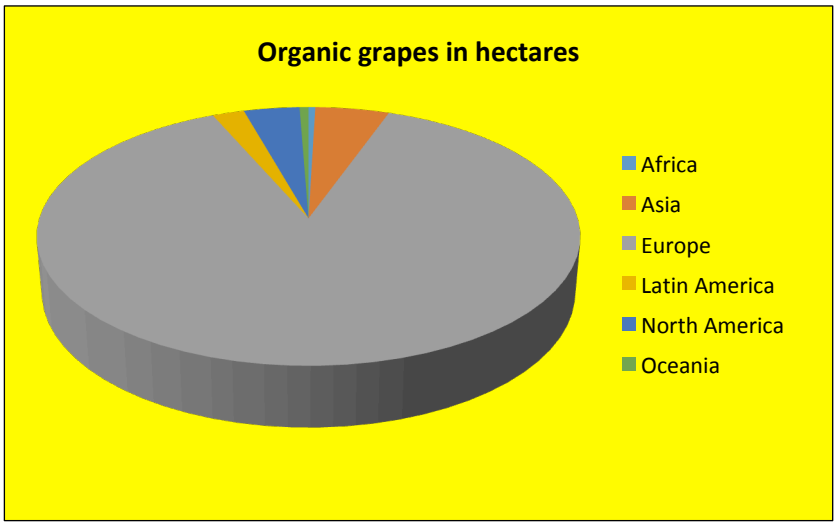

Figure 6. Global market: Distribution of organic grapes (including areas).

Source: FIBL survey 2017.

Figure 7 shows the change of organic grape cultivation between 2004 and 2015. This figure also shows that organic grape growing has been increasing steadily.

Table 3 shows that conventional and organic vineyard areas of European countries are seen. In addition, the share of organic grape growing in total production in terms of area and production is also seen. Accordingly, in terms of organic vineyard area, Italy is in the 1st place, Spain in the 2nd

place, France in the 3rd place. The organic vineyard area of our country is 1988.96 hectares. When we look at the share of organic vineyard areas in the total area, we see that Italy has the biggest share. Organic viniculture has become increasingly important in recent years in order to protect ecology, consciously produce and protect human health.

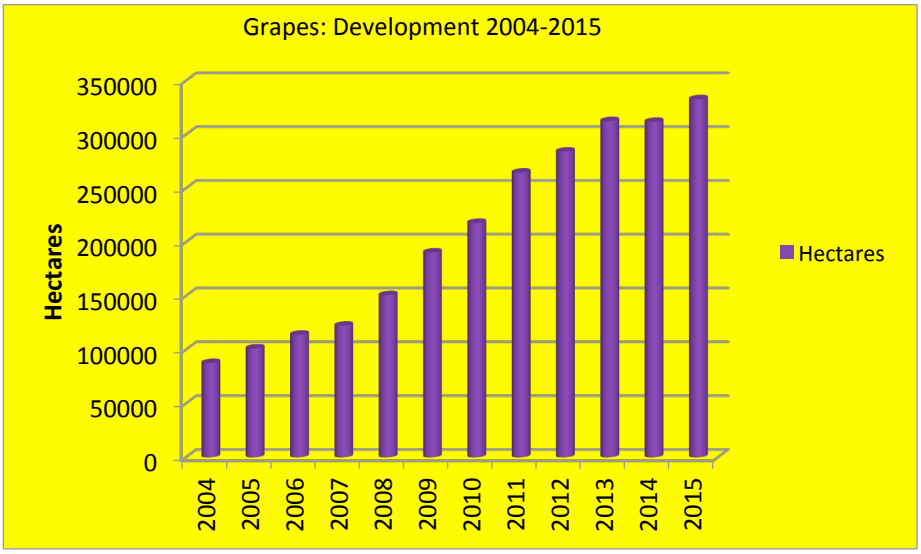

Figure 7. Grapes: Development of the global organic area 2004-2015.

Source: FIBL – IFOAM- SOEL surveys 2017.

Many countries that have gained importance in world viticulture are making organic grape cultivation.

Table 3. Organic Vineyards in European Countries (Willer and Zanoli, 2000)

Countries	**Organic vineyards (ha)**	**The share of organic vineyards in total vineyards (ha)**	**The share of organic vineyards in total vineyards (%)**	**Total area of organic production (ha)**	**Share of organic production area in total area (%)**
Austria	*564*	52.000	1.1	287.900	0.2
Czech Rep.	25	13.000	0.2	71.620	0.04
France	10.213	917.000	1.1	316.000	3
Georgia	100	85.000	0.1	-	-
Germany	1.349	105.000	1.3	383.572	0.4
Greece	1.750	132.000	1.3	15.849	11
Hungary	*350*	131.000	0.3	34.500	1.0
Italy	48.000-54.000	922.000	5.2-5.9	958.687	5-5.6
Portuga	888	259.000	0.34	47.974	1.9
Spain	21.130	1.224.000	1.7	352.164	6.0
Switzerland	209	14.991	1.4	84.124	0.3

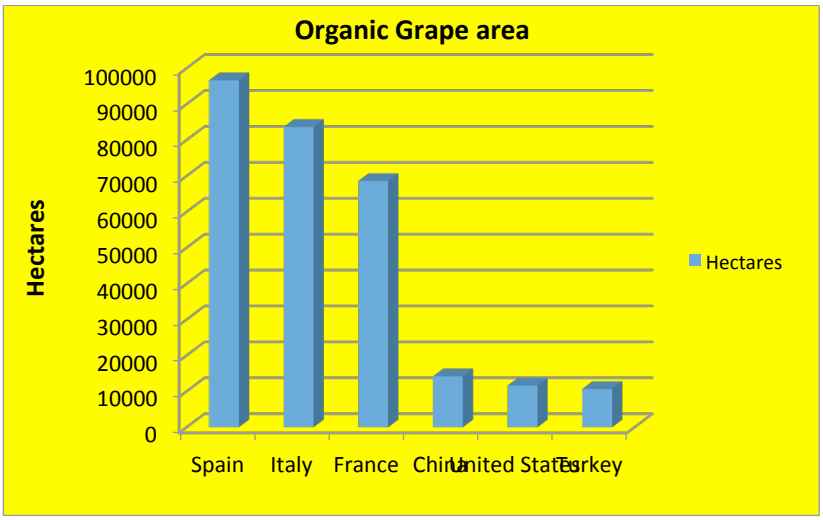

Figure 8. Grapes: organic grape area of important countries (2015)

Source: FIBL survey 2017.

Organic viticulture applied in the field of experiment is a production system that promotes and promotes soil biological activity, biological circulation and biodiversity (Mulero et al., 2010).

The main objective of organic grape production is to protect human health and the biological activity of the soil with natural fertilizers. In ecological terms, grapes are harvested mechanically, not humanly. This causes the clusters to be healthier and mature, and the loss of grapes, fruit and soil is the least (Zafrilla et al., 2003). It is important because grape seed wastes, a by-product of the wine and juice industry, are assessed and economically recycled. Grape seed oil is useful for cardiovascular health because it is a source of special oils such as linoleic acid. In addition, grape seed oil prevents oxidation due to high levels of tocopherol.

Also decrease ldl, increase hdl (high density lipoprotein). Consumption of foods rich in bioactive components is necessary for a healthier life. In recent years, many studies suggest that organic foods are consumed instead of conventional foods. Organic farming foods have higher antioxidant activity due to their high content of polyphenol composition and coverage (Assumpcao et al., 2014).

Organic grapes are in demand by the producer. Organic viticulture in our country started in 1984. The number and quantity of organic products are increasing gradually (Yıldırım et al., 2007) (Table 3). One of the most important goals in organic viticulture is to grow healthy and disease resistant plants (Hofmann et al., 2008). Organic viticulture in our country has become widespread after 2000.

Table 4 shows the organic production values of our country. Between 2005 and 2015, there was a remarkable development especially in terms of production quantity and number of producers.

Table 4. Organic production values in our country

Years	**Areas (ha)**	**Production (ton)**	**number of producers**
2005	203.811	421.934	14.401
2006	192.789	458.095	14.256
2007	174.283	568.128	16.276
2008	166.883	530.224	14.926
2009	501.641	983.715	35.565
2010	510.033	1.343.737	42.097
2011	614.618	1.659.543	42.460
2012	702.909	1.750.127	54.635
2013	769.014	1.620.387	60.797
2014	842.216	1.642.235	71.472
2015	515.268	1.829.291	69.967

Source: Tüik, 2018

The organic production values of our country are given in Table 5 (Tüik, 2018). As of 2015, the number of farmers working in organic farming is 69,967; 515,268 hectares of land and 1,829,291 tons of production.

Table 5. Turkey's organic production values

Years	Number of crops	Number of holdings	Area	Production
	(Number**)**	**(**Number**)**	**(**Hectares**)**	**(**Tonnes**)**
2005	205	14 401	203 811	421 934
2006	203	14 256	192 789	458 095
2007	201	16 276	174 283	568 128
2008	247	14 926	166 883	530 224
2009	212	35 565	501 641	983 715
2010	216	42 097	510 033	1 343 737
2011	225	42 460	614 618	1 659 543
2012	204	54 635	702 909	1 750 127
2013	213	60 797	769 014	1 620 387
2014	208	71 472	842 216	1 642 235
2015	197	69 967	515 268	1 829 291
2016	238	67 878	523 777	2 473 600

Source: Tüik, 2018.

In our country, it was determined that the total amount of grapes produced organically as of 2015 is 112,350 tons and the production quantities according to the amounts are given in Table 6. It is seen that İzmir and Adıyaman cities follow to organic grape production of Manisa Province respectively (Anonymous, 2018).

According to the values of year 2015, , it is seen that 1704 tons of organic grapes are produced in Mersin (Table 6).

Table 6. Organic grape production values of important countries in our country (tonnes)

Cities	2010	2011	2012	2013	2014	2015
Adana	33	0.3	0	19	38	61
Adıyaman	194	738	585	1.648	1.502	2.565
Ankara	125	152	94	70	253	115
Antalya	5	8	20	20	20	20
Aydın	384	240	255	1.797	406	341
Çanakkale	3.323	1.371	1.177	1.346	1.176	1.115
Eskişehir	107	99	97	98	1.119	100
İstanbul	131	131	96	148	370	370
İzmir	7.076	5.703	4.264	3.559	4.011	4.257
Kayseri	39	40	4	174	142	164
Kilis	0	43	633	116	1.156	705
Malatya	47	320	179	353	297	370
Manisa	9.175	23.777	21.053	26.890	32.382	84.948
Mersin	1.586	2.466	2.318	2.525	3.196	1.704
Muş	37	56	138	154	249	175
Niğde	379	407	381	407	492	243
Tekirdağ	169	100	229	643	423	497
Van	0	579	583	4	0.2	64

Source: Anonim, 2018

Organic agricultural activities in Turkey began in raisins and figs, one of the traditional export products in 1984 (Altındişli, 2002; Yildirim et al., 2007). In the following years, it was noticed that while this agricultural form is applied to other crops on the one hand, the number of farmers and production also increased.

Export values for the years 2014 and 2016 are shown in Table 7 of our country.

Table 7. Turkey's export values of 2014-2016

YEARS	CROP	AMOUNT (KG)	TOTAL ($)	% KG	% $
2014	RAISIN	4.118.835	13.557.823	26,48	17,2
2016	RAISIN	3.393.000	12.456.025,53	20,2	16,0

Source: Anonim 2018,

Organic grape exports data for 2015 in our country are shown in Table 8. The United Kingdom, France, Sweden, Switzerland and Germany are countries where our country has exported significant amounts of organic grapes.

Table 8. Turkey's exports of organic grapes of 2015

COUNTRIES	AMOUNT (KG)	TOTAL ($)
HOLLAND	155.480	495.904
HONG KONG	585	3.305
BELGIUM	80.970	258.571
UNITED ARAB EMIRATES	642	3.287
MALAYSIA	10.000	23.700
TAIWAN	8.000	34.400
PEOPLE'S REPUBLIC OF CHINA	50	219
SPAIN	4.000	11.133
AUSTRALIA	1.250	3.387
UNITED STATES	382.900	931.075
ITALY	94.846	349.051
GERMANY	390.393	1.153.315
FRANCE	830.897	2.622.131
SWEDEN	699.215	2.745.971
SWITZERLAND	599.970	1.765.241
UNITED KINGDOM	880.817	3.172.386

SOURCE: Anonim 2018.

CONCLUSION

The most important problem in organic viticulture is disease and pest control and inefficiency. For this purpose, selection of varieties is important. As a cover plant, the vetch plant grown in winter is used to reduce weed competition and herbicide applications. This practice, especially in organic production systems, provides nitrogen in the vetch, planted in the winter and buried in the soil in spring (Comis, 2008).

Weeds cause weed growth and reduced grape yield. Covering plants are useful for increasing soil characteristics and for reducing the entry of weeds. Plants such as vetch or oats may be used to apply mulch on the soil by cover plants (Steinmaus et al., 2008).

In organic viticulture, it is aimed to increase the yield of the resistant by disease and harmful variety. In this context, the efficiency to be obtained from the unit area should be increased by means of the researches to be done and effective measures against organic disease should be taken with disease and harm.

REFERENCES

Altındişli, A., 2002. Türkiye'de Ekolojik (Organik, Biyolojik) Tarım. Organik Tarım. Organik (Ekolojik) Tarım Eğitimi Ders Notları: 9-17.

Anonim, 2018. Gıda, Tarım ve Hayvancılık Bakanlığı Web Sitesi. http://www.tarim.gov.tr/Konular/Bitkisel-Uretim/Organik- Tarim/Istatistikler.

Assumpçao, C.F., Nunes, I.L., Mendonca, T.A., Jablonski, A., Flores, S.H., Rios, A.O., 2014. The quality, Stability, and Bioactive Compound Composition of Virgin and Refined Organic Grape Seed Oil. Journal American Oil Chemists Society 91:2035-2042.

Coll, P.,Le Cadre, E., Villenave, C., 2012. How are nematode communities affected during a conversion from conventional to organic farming in southern French vineyards? *Nematology,* Vol. 14(6), 665-676.

Comis, Don., 2008. New Vetch For Northern Climes- And Organic Growers. Agricultural Research, 56(4) :18-19.

Dragincic, J., Korac, N., Blagojevic, B., 2015. Group Multi-Criteria Decision Making (GMCDM) Approach For Selecting The Most Suitable Table Variety Intended For Organic Viticulture. Computers And Electronics İn Agriculture, 111: 194-202.

Farhud. D.D., 2015. Impact of Lifestyle on Health. Iranian Journal of Public Health, Nov; 44(11): 1442–1444.

www.fibl.org. FIBL & IFOAM- ORGANICS INTERNATIONAL. The World of organic agriculture. Statictics & Emerging Trends 2017. http://www.fibl.org/de/startseite.html. date of access: January 15, 2018.

Ha, M.H., Lee, D.H., Jacobs, D.R., 2007. Association between Serum Concrentrations of Persistent Organic Pollutants and Self-Reported Cardiovascular Disease Prevalance: Results from the National Health and Nutrition Examination Survey, 1999-2002. Environmental Health Perspectives, 115:8, 1204-1209.

Hofmann, U., Heibertshausen, D., Baus-Reichel, O., Berkelmann-Loehnertz, B., 2008. Optimisation of downy mildew (Plasmoparaviticola) control in organic viticulture with low copper doses, new copper formulations and plant strengtheners, results of four years of on farm research, In: 16th IFOAM Organic World Congress, Modena, Italy, June 16-20.

Mulero, J., Pardo, F., Zafrilla, P., 2010. Antioxidant Activity and Phenolic Composition of Organic and Conventional Grapes and Wines. Journal of Food Composition and Analysis, 23: 569-574.

Steinmaus, S., Elmore, C.L., Smith, R.J., Donaldson, D., Weber, E.A., Roncoroni, J.A., Miller, P.R.M., 2008. Mulched Cover Crops As An Alternative To Conventional Weed Management Systems İn Vineyards. European Weed Research Society Weed Research, 48: 273- 281.

Suk, W.W., Ahancıan, H., Asante, K.A., Carpenter, D.O., diaz-barriga, F., Ha, E-H., Huo, X., King, M., Ruchirawat, M., Silva, E.R., Sly, L., Sly, P., Stein, R.T., Berg, M.V.D., Zar, H., Landrigan, P. 2016. Environmental pollution: An under-recognized threat to children's health, especially in low- and middle-income countries. Environmental Health Perspectives, 124:3, 41-44.

Trzpiot, G. And Orwat-Acedanska, A., 2016. Spatial Quantile Regression in Analysis of Healthy Life Years in the European Union Countries. Comperative Economic Research, 19:5, 179-197.

Tüik, 2018. Türkiye İstatistik Kurumu. Bitkisel Üretim İstatistikleri Veri Tabanı. http://www.tuik.gov.tr/UstMenu.do?metod=temelist. date of access: January 18, 2018.

Yıldırım, H.K., Altındişli, A., Akçay, Y.D., Güvenç, U., Sözmen, E.Y., 2007. Physical Characteristics and Antioxidant Activities of Organic Grapes. Journal of Food Biochemistry, 31: 81-95.

Zafrilla, P., Morillas, J., Mulero, J., Cayuela, J.M., Martinez-Cacha, A., Pardo, F., Manuel, J. and Nicolas, L., 2003. Changes During Storage in Conventional and Ecolojical Wine: Phenolic Content and Antioxidant Activity. Journal Agriculture Food Chemistry, 51, 4694-4700.

PHYSICO-CHEMICAL CHARACTERIZATION OF THE MUNICIPAL WASTEWATER OF OUED EL HARRACH, AN EVALUATION OF POLLUTION DEGREE WITH HEAVY METALS

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Abstract

We conducted a study to determine the physic-chemical quality of some municipal wastewater in urban areas. The triplicate samples of municipal wastewater was collected from a wastewater stream flowing over nearby location of city of El Harrach (latitude deg. North 36.710455, longitude deg. East 3.12295), 11 km east of Algiers, Algeria. Collected wastewater was brought immediately to laboratory; the samples were filtered through Millipore filter paper (0.45 µm) acidified with nitric acid and kept in Teflon® bottles, at 4 °C, in the dark. The analyzed parameters are temperature (T), the pH, the total dissolved solids (TDS), electrical conductivity (EC), redox potential (E_h) and Heavy Metals ions (Pb, Zn, Cu, Cd, Ni). From the first description of the compositions and conditions of water pollution in the studied sites, we conclude that the waters of the studied sites have poor quality or even unfit for human consumption, which requires an adequate treatment before rejection in the area. It is important to note that these heavy metals elements present in the effluent are below the permissible limit values of Algerian standards for liquid discharges.

Keywords: Municipal Wastewater, Heavy metals, Physico-chemical characterization of water, Water resources, AAS.

INTRODUCTION

Lead, copper and zinc are heavy metals of concern for their role in environmental pollution, as have toxic effects in humans via inhalation, oral ingestion and/or skin contact. The presence of these metals in the human body may induce elevated blood pressure, anemia, and gastrointestinal, cardiovascular, nervous and memory diseases. Numerous recent studies have focused on analyzing the natural concentrations of several ions and metals in water, to isolate anthropogenic and natural sources that affect water quality, and establish interactions that take place within the aquifer (Aghazadeh and Mogaddam 2010; Jacintha et al. 2016; Ehya and Marbouti 2016; Sethy et al. 2016). A large number of groundwater studies also have focused specifically on the assessments of its suitability for drinking and irrigation purposes (Sarikhani et al. 2015; Cao et al. 2016). Water quality depends on a number of factors such as geology, degree of chemical weathering of the various rock types, quality of recharge water, and water–rock interaction (Domenico and Schwartz 1990; Guler and Thyne 2004; Ayenew et al. 2008). Thus main objectives of the present study are to determine the municipal wastewater quality of river of oued el Harrach and to delineate regions where municipal wastewater r is suitable or unsuitable for irrigation and industrial purpose.

2.1 Municipal wastewater collection

The triplicate samples of municipal wastewater was collected from a wastewater stream flowing over nearby location of city of El Harrach (latitude deg. North 36.710455, longitude deg. East 3.12295), 11 km east of Algiers, Algeria. Collected municipal wastewater was brought immediately to laboratory.

Sample was collected just before the starting of experimentation in order to avoid alternation in the wastewater characteristics mainly due to open storage of sample. Before treatment, the samples were filtered through Millipore filter paper (0.45 µm) and kept in Teflon® bottles, at 4 °C, in the dark. The general characteristics of the municipal wastewater are presented in Table 1 Concentrations of Pb(II) and Cd(II) are high enough to be considered as a serious environmental problem. Therefore, they were chosen for our study.

2.2 Analyses

Metal concentrations were determined by sampling at the indicated times. A 0.25 ml aliquot from both the feed and striping solutions was then analyzed with an atomic absorption spectrophotometer (Varian AA 110). For, the municipal wastewater samples: The pH, electrical conductivity (EC), redox potential (Eh) and Total Dissolved Solids (TDS) were analyzed with a multifunctional pH meter (HANNA HI 2550).

3. Results and discussion

The various physico-chemical parameters obtained from analysis of municipal wastewater samples from Oued El Harrach area are presented in Table 1. The wastewater of the study area has pH value of 6.48, which indicates that the wastewater is mildly acidic in nature. The electrical conductivity (EC) of municipal wastewater have value of 1236 µS/cm, this value indicate that in samples the enrichments of salts are low. Higher value of EC (>3000 µS/cm) can be due to the dissolution of minerals and the influence of anthropogenic contamination, causing increases in ionic concentration.

TABLE 1 - Physical-chemical characteristics of municipal wastewater sample used for experiments.

pH	TDS	E_h	EC	Pb^{+2}	Zn^{+2}	Cu^{+2}	Cd^{+2}	Ni^{+2}
6.48±**0.10**	828	272	1236	23±**1**	128±**10**	93±**6**	7±**0.5**	36±**1.16**

All values in (µg/L) except TDS (mg/L), E_h(mV), EC (µS/cm) and pH

Large variations in EC and TDS values are attributed to geochemical process like ion exchange, evaporation, sediment dissolution, and rainwater infiltration (Ehya and Marbouti 2016) and anthropogenic sources (such as domestic sewage, septic tanks, and agricultural activities). The suitability of the municipal wastewater for industrial, and irrigation purposes was evaluated by comparing the values of different water quality parameters with those of the World Health Organization (WHO 2004) guideline values for drinking water. We have concluded that this municipal wastewater where not contaminated with heavy metals.

4. Conclusion

The present study showed that all the physicochemical parameters for municipal wastewater in river dumpsite are medium. We conclude that the waters of the studied sites have poor quality or even unfit for human consumption, which will help the allied agencies and policy makers to focus on the specific contaminants sources and then requires an adequate treatment before rejection in the area. It is important to note that these heavy metals elements present in the effluent are below the permissible limit values of Algerian standards for liquid discharges.

References

Aghazadeh N, Mogaddam AA (2010) Investigation of hydrochemical characteristics of groundwater in the Harzandat aquifer Northwest of Iran. Environ Monit Assess 176:183–195

Ayenew T, Demlie M, Wohnlich S (2008) Hydrogeological framework and occurrence of groundwater in the Ethiopian aquifers. J Afr Earth Sci 52:97–113

Cao Y, Tang C, Song X, Liu C, Zhang Y (2016) Identifying the hydrochemical characteristics of rivers and groundwater by multivariate statistical analysis in the Sanjiang Plain, China. Appl Water Sci 6:169–178

Domenico PA, Schwartz FW (1990) Physical and chemical hydrogeology. Wiley, New York, p 824

Ehya F, Marbouti Z (2016) Hydrochemistry and contamination of groundwater resources in the Behbahan plain, SW Iran. Environ Earth Sci 75:455

Guler C, Thyne GD (2004) Hydrologic and geologic factors controlling surface and groundwater chemistry in Indian Wells–Owens Valley area southeastern California USA. J Hydrol 285:177–198

Jacintha TGA, Rawat KS, Mishra A, Singh, SK (2016) Hydrogeochemical characterization of groundwater of peninsular Indian region using multivariate statistical techniques. Appl Water Sci doi:10.1007/s13201-016 0400-9

WHO (2004) Guidelines for drinking water quality. World Health Organization, Geneva

OPTIMIZATION OF PARAMETERS INFLUENCING PHENOL REMOVAL FROM SYNTHETIC WASTEWATER USING POLYMERIC INCLUSION MEMBRANE

NADJIB BENOSMANE, BAYA BOUTEMEUR, SAFOUANE M.HAMDI, MAAMAR HAMDI

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Abstract

In the present work, the Optimization of parameters influencing phenol elimination from aqueous solution through polymer inclusion membrane (PIM) was studied, based on mixture of cellulose triacetate (CTA) and cellulose acetate (CA) as support (75%/25%), calix[4]resorcinarene derivative as a carrier and 2-Nitrophenyl octyl ether (2-NPOE) as plasticizer. The parameters tested and optimized in this investigation were: stirring speed, pH phases, and phenol initial concentration on the removal efficiency of phenol from synthetic wastewater. A PIM containing 0.1 g (of mixture polymer), (0.15g/g mixture of polymer) of carrier and (0.03ml/g mixture of polymer) of 2-NPOE, provided the highest percentage of phenol removal efficiency over a 6 days of transport, the removal was found to be about 95%. This study proves that the PIM with cellulose derivatives as base can be used effectively to remove phenols from wastewaters.

Keywords: PIMs, Cellulose derivatives, Wastewater treatment, Phenol Removal.

Introduction

Phenolic wastewater becomes a great concern in wastewater treatment. There are many methods technologies have been applied to remove phenol and its derivatives from wastewater, including the conventional methods of extraction (Bendini 2003) chemical oxidation (Amiri 2011), biodegradation (Tobajas 2012), and sorption (Hao 2009). Of these methods, membrane separation appears to be a suitable process based on overall separation performance. Studies on membrane separation of small organic molecules from dilute aqueous solutions have included systems based on bulk liquid membranes (Teresa 2007), emulsion liquid membranes (Manzak 2004), and supported liquid membranes (Badgujar and Rastogi 2011; Juang 1997). PIMs have attracted increasing interest due to their potential to reduce the chemical hazards associated with conventional solvent extractions technologies. In PIMs techniques, a complexant agent the carrier is including in a base polymer with a plasticizer. In recently conducted studies we have verified the suitability of PIMs with Cyanex 923 as carrier and CTA as a base polymer to extract phenol from its dilute acidic solution and transport it quantitatively into receiving a solution containing at least 0.25 M of NaOH (Pérez-silva 2013). The PIMs applied in these studies are relatively stable and provide the potential for a safe method for the removal of phenol from dilute aqueous solutions. In previous work (Benosmane 2016) we have tested the transport of phenol through polymer inclusion membrane using triacetate cellulose (CTA) only as support. In this work we tested the applicability of polymer inclusion membrane (PIM) with the mixture of cellulose triacetate (CTA) and cellulose acetate (CA) as base for phenol elimination from synthetic wastewater. The elimination efficiency characteristics of phenol from aqueous solutions were investigated through a batch study.

Materials and Methods

2.1 Membrane Preparation: PIMs were prepared according to the procedure reported by Sugiura (Sugiura 1987), the amount of each constituent was a function of the series of experiments to be performed. Thus, for CTA and CA membrane 10 ml of a polymer solution (0.1g of mixture polymer CTA :75%+ CA: 25% in dichloromethane), calix[4]resorcinarene (0−0.06g/g mixture of polymers), and plasticizer (0−0.03ml of plasticizer/g mixture of polymers)

2.2 Phenol Analyses: The phenol quantification in the transport experiments was carried out using a UV/vis spectrophotometer Jenway-Serie 6800 at 210 nm.

2.3 Transport Experiments: A typical laboratory scale device was used for phenol transport experiments through the PIM. It consisted of two compartments made of Teflon with a maximum capacity of 400 ml separated by the PIM and the PIM area exposed to the aqueous phase were 12.56 cm^2. One of them contained 10^{-3} M of phenol as the feed phase, and the other, the stripping phase, contained NaOH in different concentrations. All transport experiments were carried out in duplicate keeping the aforementioned cell at room temperature (25 °C). In all figures, the reported error bars represent the standard deviation of the data.

3. Results and Discussion

3.1 Effect of stirring speed

The effect of stirring speed of feed phase in case of phenol elimination using PIM was determined by varying the stirring speed from 200 to 800 rpm (Fig. 1). It was observed that the transport of phenol increase from 200 to 600 rpm and beyond 600 rpm, there was no appreciable increase, because that the aqueous boundary layer thickness decreased continuously with increasing stirring speed up to 600 rpm.

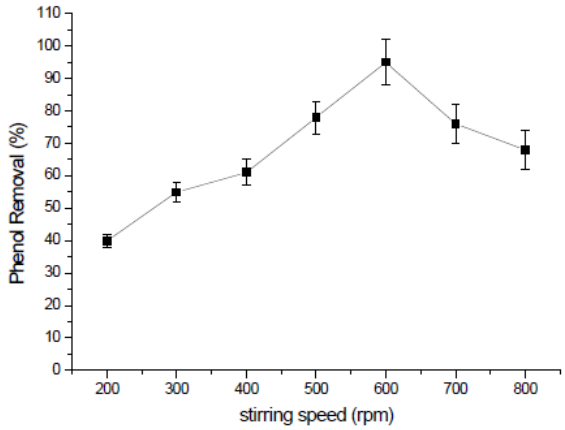

Figure. 1. Effect of stirring speed on removal of phenol

Transport conditions: Feed phase: phenol 10^{-3} M, pH 2. Stripping phase: NaOH 0.20 M. Membrane: 12.60 cm^2 of surface area, Calix[4]resorcinarene: RC8 (0.15 g/g mixture of polymers), 0.03 ml 2-NPOE/g mixture of polymers. Values obtained after 6 days of transport

3.2 Effect of initial concentration of phenol

The effect of initial phenol concentration range between 0 and 0,0025M in feed phase on the transport flux is presented in Fig.2. % transport increases with phenol concentrations increase from 0 to 0,001M, beyond which a decrease in transport was been which was attributed to the formation of a milky layer on the membrane surface. This observation was likely one of the reasons of the flux limit. However, other reasons could be related to the kinetics of the phenol uptake, which could have reached its maximum value, or to a complex of different stoichiometries formed at the highest phenol concentration less soluble in the PIM core.

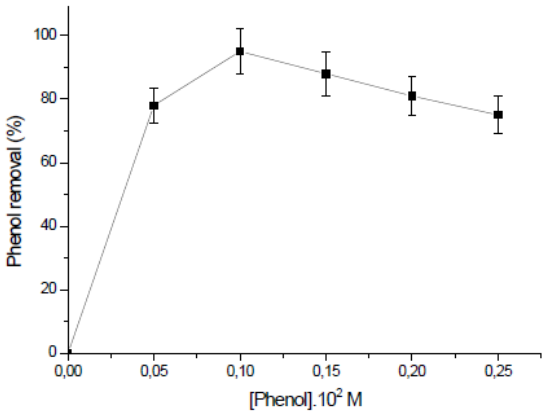

Figure. 2: Effect of initial concentration of phenol

Transport conditions: Feed phase: phenol (0-0,0025 M), pH 2. Stripping phase: NaOH 0.20 M. Membrane: 12.60 cm^2 of surface area, Calix[4]resorcinarene: RC8 (0.15 g/g mixture of polymers), (0.03 ml 2-NPOE/12.56 cm^2 mixture of polymers). values obtained after 6 days of transport

3.3 Effect of pH solution of feed phase on the removal efficiency of phenol

In this part, the effect of pH in feed phase on the transport of phenol was tested. It can be observed in Table-1. When the feed solution pH is equal to 2, the elimination efficiency of phenol reach the maximum 95%, this result is in agreement with those obtained by Pérez-Silva et al. (2013) and Benosmane et al. (2016), the phenol-calix[4]resorcianarene complex was formed by hydrogen bond, in addition the degree of ionization of phenol was comparatively stronger at the higher pH (pH>3). Which decrease the complexation rate between calix[4]resorcianrene and phenol.

Table-1 Effect of pH solution of feed phase on the removal efficiency of phenol

pH in Feed Phase	Concentration of NaOH in Strip phase	Phenol Removal (%)
2	0.20 M	95,06 (7,65)
4	0.20 M	70,65 (6,54)
6	0.20 M	58,98 (6,34)
8	0.20 M	41,76 (5,97)
10	0.20 M	36,76 (4,28)
12	0.20 M	21,65 (4,78)

Transport conditions: Feed phase: phenol 10^{-3} M, pH 2-12. Stripping phase: NaOH 0.20 M. Membrane: 12.60 cm^2 of surface area, Calix[4]resorcinarene (0.15 g/g mixture of polymers), 0.03 ml 2-NPOE/g mixture of polymers. Values obtained after 6 days of experimentation. % RSD in parentheses

Conclusion

This work has demonstrated the developed PIM on the elimination of phenol from synthetic wastewater. The method was simple, easy and also rapidly applied for wastewater sample. The results show that the PIM with the mixture of CTA and CA has the high analytical potential for removing phenol from water samples.

References

Amiri H, Jaafarzadeh N, Ahmadi M, and Martinez S.S (2011) Application of LECA modified with Fenton in arsenite and arsenate removal as an adsorbent. Desalination 272: 212-217.

Bendini A, Bonoli M Cerretani, L Biguzzi, B Lercker, G Toschi, T, G (2003) Liquid- liquid and solid-phase extraction of phenols from virgin olive oil and their separation by chromatographic and electrophoretic methods. Journal of chromatographic A 985: 425-433.

Benosmane N, Boutemeur B, Hamdi M, Hamdi S.M (2009) Selective transport of metal ions across polymer inclusion membranes (PIMs) containing calix[4]resorcinarenes. Separation and Purification Technology 65: 211–219.

Benosmane N, Boutemeur B, Hamdi M, Hamdi, S.M (2015) Application of cellulose acetate membranes for removal of toxic metal ions from aqueous solution. Fresenius Environmental Bulletin 24: 2296-2309.

Benosmane N, Boutemeur B, Hamdi S. M, Hamdi M (2016) The removal of phenol from synthetic wastewater using calix[4]resorcinarene derivative based polymer inclusion membrane, Algerian J. Env. Sc. Technology, 2:2 : 26-33

Hao X, Pritzker, M, and Feng X (2009) Use of pervaporation for the separation of phenol from dilute aqueous solutions. Journal of Membrane Science 335 (1): 96-102.

Badgujar V, and Rastogi N.K (2011) Extraction of phenol from aqueous effluent using triglycerides in supported liquid membrane, Desalination and water treatment., 36 : 187-196.

Juang R.S, Chen L.J (1997) Transport rate of citric acid across a supported liquid membrane containing salts of a tertiary amine. Journal of Membrane Science 123: 81–87.

Manzak A, Tutkun O (2004) Extraction of citric acid through an emulsion liquid membrane containing aliquat 336 as a carrier. Separation Science and Technology 39: 2497–2512.

Pérez-Silva I, Galán-Vidal C.A, Ramírez-Silva M.T, Rodríguez J.A, Álvarez-Romero G.A, and Páez-Hernández M.E (2013) Phenol Removal Process Development from Synthetic Wastewater Solutions Using a Polymer Inclusion Membrane. Ind. Eng. Chem. Res 52 : 4919−4923.

Sugiura M, Kawa M. K, Urita S (1987) Effect of plasticizer on the carrier-mediated transport of zinc ion through cellulose triacetate membranes. Separation Science and Technology 22; 2263.

Teresa M, Reis A, Ondina M.F, Rosinda M, Ismael C, Jorge M, Carvalho R (2007) Recovery of phenol from aqueous solution using liquid membranes with Cyanex 923. Journal of membrane science 305: 313-324.

Tobajas M, Mohedano A.F and Rodriguez J.J (2012) Enhancement of cometabolic biodegradation of 4-chlorophenol induced with phenol and glucose as carbon sources, Journal of environmental management 95 :116-121.

EFFECTS OF TERRESTRIAL INPUTS ON THE QUALITY OF COASTAL WATERS IN NORTHEASTERN MEDITERRANEAN

NEBIL YUCEL

Eutrophication is mostly observed in nutrient rich coastal waters and displays an increasing trend in recent years creating a risk for coastal ecosystems. Rapid increase in eutrophication in time in nutrient rich coastal waters threats coastal ecosystems severely. Agricultural and anthropogenic activities and untreated urban wastewater supply nutrients to the coastal and estuarine waters, where rate of the primary production increases quickly. For this reason, water quality decreases, and coastal ecosystem is affected negatively. Shallower and semi-closed ecosystems with limited seasonal stratification and exchange with offshore waters are most affected. Because of the limited exchange with offshore waters inner parts of the Mersin and Iskenderun Bays become more eutrophic than the deeper sectors. Under natural conditions, the system is stable, but after high nutrient input, an abnormal phytoplankton bloom could be seen in the bay's ecosystem. It can be a source of harmful phytoplankton blooms in the area. Discharge of rivers and treated-untreated waste waters reduce quality of coastal waters and in turn become a threat for coastal pelagic and benthic ecosystems. Although northeastern Mediterranean is classified as the least productive sea among the world oceans, shelf waters displayed eutrophic characteristics in coastal areas. There are many perennial rivers (Seyhan, Ceyhan, Goksu and Berdan and Lamas Rivers) discharging to the shelf. Annual Si, PO4, NH4, and NO3 load were calculated for the last twenty years as 17409 ton/year, 919 ton/year, 1187 ton/year and 6159 ton/year in Seyhan River, 20534 ton/year, 267 ton/year, 1209 ton/year and 6679 ton/year in Ceyhan River, 4464 ton/year, 145 ton/year, 139 ton/year and 1153 ton/year in Göksu River, 484 ton/year, 28 ton/year, 90 ton/year and 225 ton/year in Berdan River, 300 ton/year, 1 ton/year, 1 ton/year and 134 ton/year in Lamas River, respectively. Such tremendous terrestrial nutrient inputs have increased primary production and number of algal blooms in the shallow shelf. Monthly remote sensing and in-situ chlorophyll data show that eutrophication has increased and water quality decreased within the last fifteen years (2003-2017). Eutrophication became more pronounced during winter and spring in the area. In addition, human activities (domestic, agricultural and industrial activities) also contribute significantly to the eutrophication phenomenon. Based on satellite images and in-situ chlorophyll data, chlorophyll concentrations were found four times higher in Iskenderun and twelve times higher in Mersin Bay coastal waters compared to offhore ones. To protect coastal degredation measures should be taken to reduce nutrient loads through rivers and anthropogenic/unnatural sources.

EARTHWORM BIOMARKERS APPLIED IN ECOTOXICOLOGICAL STUDY OF SOIL

HAYET BELMESKINE

Earthworms account for 60-80% of terrestrial wildlife and are particularly used as bioindicators of chemical soil contamination in ecotoxicological tests because of their important role in maintaining fertility and soil structure. The species Eisenia fetida and Eisenia andrei are highly recommended in standard soil ecotoxicology tests (OECD 2004). Based on these tests, a battery of biomarkers was used to evaluate the impact of soil toxicity on earthworms Eisenia andrei by exposure, under laboratory and field conditions, to soils from the vicinity of an hazardous waste incinerator. This study was conducted using soils from different sites near the incinerator, in addition of an artificial (OECD) and reference soils. The measurement of immunological (phagocytosis), enzymatic (CAT, GST, SOD) and cellular (LMS) biomarkers showed a variabiliy in response. In fact, in laboratory exposure, the phagocytosis and enzymatic biomarkers assays were less sensitive than LMS (NRRT) assay for soils located under the plume dispersion. While, in field conditions, the phagocytic activity and efficiency were significantly induced.

INTERFERENCE OF WEEDS SPECIES IN HENNA FIELDS

KELTOUM BENAISSA, MOHAMED BELHAMRA

Protection of ecological equilibrium is necessary for all living life. The environmental conditions that form the ecological balance are closely related to plant, animal and human health. However, due to environmental pollution and the decrease of natural resources, the ecological system is affected negatively. Factors such as urbanization, rapid population growth, industrialization, agricultural fertilizers and agricultural chemicals increase environmental pollution and human health is effected adversely. For this reason, the healthy lifestyle is gaining more importance in the world and in our country in recent years. Organic nutrition for this purpose, It has become necessary. Increasing the consumption of organic products is compulsory to avoid harmful effects of chemical substances. Ecological elements have been damaged since years due to conventional agriculture. Organic growing is one of the ways to minimize this loss. With the increase of environmental consciousness, organic farming is being carried out in every area of agriculture for a long time. Organic viniculture is one of these areas. Organically grown table grape and seedless grape production is demanded highly by consumer. Owing to organic viniculture, our natural resources can be used efficiently, ecosystem balance can be preserved, environmental pollution can be reduced and nutrition with organic products can be provided for healthy life. The use of organic agriculture as an effective means of sustainability of our living resources is at the forefront, and it is becoming compulsory for individuals and societies to take measures to protect nature.

INVESTIGATION OF THE EFFECTS OF BORIC ACID AND BORIC ACID WASTES ON ALKALI ACTIVATED FLY ASHES

EYUP EREN,EMEK MOROYDOR DERUN,SABRIYE PISKIN

The cement industry makes a significant contribution to the world's carbondioxide emissions, accounting for 1.45±0.20 Gt/y in 2016. Today, there is increasing research interest in the development of alternative binders for Portland cement in order to reduce carbon dioxide emissions.However, no alternative to Portland cement has been found that matches both its cost of production and its superior physical and mechanical properties.Production of mortar and concrete with alkaline activation methods may be an alternative to traditional Portland cement mortar and concrete. In this study, the effects of set retarders on alkali-activated fly ash mortar blends were investigated.Edremit, Icdas, Izmir Demir Celik , Tuncbilek, Yatagan, Paksoy, and Sugozu fly asheswere used as binder materials.Fly ash samples were analyzed according to European standardEN 450-1 and theirchemical compositions were determinedby X-ray fluorescence. The activation process was carried out with sodium silicate and sodium hydroxide solutions. The effects of the activators on the setting timesweredetermined for each fly ash sample.Setting times were delayed using boric acid and boric acid slurry wastesfrom Etimaden Bandırma.The effects of boric acid and boric acid wastes on the alkali activation process were determined by measuring the compressive strength, setting time, and consistency characteristics of the mortar blends.

STUDY OF SOME PHYSICO-CHEMICAL PROPERTIES OF THE SOILS IN THE REGION OF AIN BENOUI BISKRA

FATIMA HIOUANI

The objective of this work, is the study of some physicochemical properties of soils the region of Ain Benoui, in the southwest of Biskra. This region is characterized by gypso - limestone material, an arid climate and à water table that is usually salty. The results of this study show that the soils studied are salty to heavily salted, with a basic pH, a low cation exchange capacity, low organic matter content, and low porosity. So soil properties are influenced by the conditions of the study area.

THE EFFECT OF FUSION TEMPERATURE ON SILICA EXTRACTION FOR ZEOLITE SYNTHESIS

GIZEM YILMAZER, SABRIYE PIŞKIN

Chemical Engineering Department, Yildiz Technical University Energy requirements for the developing countries in particular are met from coal-based thermal power plants. Disposal of a growing amount of waste from thermal power plants such as fly and bottom ash creates environmental problems. Coal ash, 80% of which is very fine in nature and is thus known as fly ash is collected by electrostatic precipitators in stacks. The increasing amount of fly ash means that environmental problems are also increased. Disposal of the increasing amounts of coal ash is becoming a serious concern to the environmentalists as the re-use/utilization rate is too low. Additionally, overflow and blow-off the ash towards residential areas is causing unnecessary human exposure and has serious health risks. There are many studies about fly ash recycling and using. Fly ash can be used as a raw material for zeolite synthesis in order to alumina and silica components they have. In this study, the extraction of soluble silicates and aluminates from coal fly ash of Tuncbilek Power Plant was investigated in order to obtain zeolitic material. Fusion step was increased the soluble silicates so it was performed before the extraction. The effect of fusion temperature was investigated with four different temperature (350, 450, 550, 650 °C). As a result, the optimum fusion temperature was determined 550 °C for synthesis of zeolite

ATTEMPT TO BREED TRICHOGRAMMA EMBRYOPHAGUM ON A SUBSTITUTE HOST, POPULATION OF PITYOCAMPA CLADE PROCESSIONARY IN ALGERIA

SARRA AYACHE, CHAKALI GAHDAB

The egg parasitoid Trichogramma embryophagum has been widely used to control insect pest, especially against the processionary moth, Thaumetopoea pityocampa in Algeria. was.The existence of two clades of the processionary moth; ENA and Pityocampa in our investigation also their special and temporal distribution led us to test breeding of the T. embryophagum, which emerged from egg batches of T. Pityocampa collected from Chrea in the egg batches of the Pityocampa clade which were collected on August from the pine plantation of Moudjbara The protective scales of the egg batches which collected from the pine plantation of Moudjbara were moved to facilitate the parasitism. The breeding tests were carried out under laboratory conditions (T = 25 + 2 ° C and HR = 65 + 5%), after 9 days, 50% of the population were emerged successfully, at 4 ° C., 50% of the population was reduced to 4 days and 2 days for storage for 2 months. A success rate of 44% was noted from the breeding monitored in ambient laboratory conditions. A greater percentage of 56% was obtained after one month of storage at (4 °C.). This rate was limited to 20% for the third test of two months of storage. The results highlighted that there are number of eggs parasitized differ significantly in the three farms (p =0.003), the environmental conditions particularly temperature affects the embryonic development of this species. Frequently, the adult of T. embryophagum may have more than one emergence hole per egg, generally one to three holes, emergence rates by a hole exceeded 89% for the three populations tested, while the cases of 2 and 3 holes per egg remained very limited. It is interesting to note that about ten individuals can emerge from a single egg. The longevity of Trichogramma embryophagum from herds varies between 1 to 20 days. Individuals from the two-month storage period have a variable longevity of 4 to 8 days. The duration of storage significantly affects the life time of the population in question.

THE DEVELOPMENT OF ADSORBENT USING INDUSTRIAL WASTES FOR THE PROTECTION OF AQUEOUS ECOLOGICAL SYSTEM FROM THE HEAVY METAL POLLUTION

SEULGI KANG, DONG-SU KIM

The feasibility of the application of adsorbent which was prepared using the blast furnace slag was examined for the removal of lead ion in wastewater. the effect of pH and temperature on adsorption were investigated and the equilibrium and kinetic studies were carried out for the systematic analysis of lead ion adsorption. In addition, the effect of ionic strength on adsorption and desorption features of adsorbate were examined. Depending on the experimental results, it was concluded that the slag has a high potential as an effective adsorbent for the removal of lead ion in wastewater.

THE ANALYSIS OF LEED REGARDING ITS WEIGHTING SYSTEM AND APPROACH ON REGIONAL VARIATIONS

OZGE SUZER

Global awareness of rapidly increasing environmental problems, such as depletion of natural resources, global climate change or environmental pollution, along with their negative impacts on social and financial concerns drew the attention of the construction industry towards sustainable development. Recently, numerous environmental assessment tools have emerged that are being used both nationally and internationally to evaluate the environmental impact of construction activities. However, if an assessment scheme is not customized according to changing conditions of candidate projects, realistic results might not be displayed regarding the location and the type of construction. Therefore, the issue of weighting evaluation criteria and regional variations integrated in these globally used rating systems becomes a fundamental consideration since it determines how the performance of a building is reflected. One of the major rating systems that reveals such problems is the US-originated but globally used Leadership in Energy and Environmental Design (LEED) tool. This study examines the approach of LEED green building certification system in the New Construction and Major Renovations scheme in version 3 (LEED NC, v.3) and the Building Design and Construction scheme in version 4 (LEED BD+C, v.4), with respect to the issues of weighting evaluation criteria and handling regional variations. An overview of the scoring system of LEED, namely its categories and assigned weights along with the system behind its credit point allocations are explained for both versions. The shortcomings, within the framework of the main issue of this study, found in the previous and currently used versions of LEED are discussed and are expected to continue to be of major concern in the design process of its future revisions

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ADAPTATIVE MEASURES TO HARVEST POTENTIAL YIELD OF SOYBEAN [GLYCINE MAX (L.) MERR.] UNDER VARIED ENVIRONMENTAL CONDITIONS

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The selection of salt tolerant crop species in response to different salinity levels is a pre-requisite as adaptive measures under different ecological conditions. The potential yield to arable crops vary greatly due to their genetic make-up, quality of irrigation water and particularly farm management practices in saline areas. Thereby, research studies were conducted at Institute of Pure and Applied Biology, Bahauddin Zakariya University, Multan- Pakistan. The treatments were consisted of two factors, (a) soybean seven lines, “NARC-1”, “NARC-2”, “D.A”, “Ajmeri”, “PSC-60”, “Rawal”-1 and “William-82” and (b) two salt levels, 0, 150 mM (NaCl), arranged in a completely randomized design and repeat four times. The seedlings were harvested at day 28 after complete germination. The result showed that, that lines deferred significantly in germination percentage. The lines were categories in three groups, i.e., highly salt-tolerant (NARC-1.NARC-2); moderate salt-tolerant (Rawal-1, D.A, PSC-60) and salt-sensitive (William-83, Ajmeri) ones. The soybean lines “NARC-1” and “NARC-2” produced significantly high biological yield in comparison with lines on soils saliniized with 150mM (NaCl) solution. The values of chlorophyll constituents ‘a’ and ‘b’ in the sensitive variables were reduced significantly compared to salt-tolerant ones. The imposition of salinity at the level of 150 mM (NaCl) caused reduction in total soluble proteins and free amino acids in salt-tolerant levels, NARC-1 and NARC-2 by a quantum of 19 percent over non-saline soil. Whereas, reduction of 20-25% was recorded in moderately salt-tolerant lines. The antioxidant enzymes (catalase), and oxidants i-e malondialdehyde (MDA), and hydrogen peroxide (H2O2) were increased with simultaneously reduction in CAT (catalase) under saline environment in comparison with non-saline conditions. The analysis of SDS-PAGE indicated different binding pattern in salt-tolerant and sensitive soybean lines. The lines NARC-1 and NARC-2 were found to be salt-tolerant compared to other lines, when exposed to 150mM (NaCl) salt stress. The salt-resistant lines “NARC-1” and “NARC-2” accumulated higher amounts of K+ ion content in shoot and root organs, with concurrent lowering down amount of Na+ ion in these plant parts. The findings from this research study showed that salt-tolerant lines, namely, “NARC-1” and “NARC-2” may cultivate on saline soils soybean farmers. The farmers will harvest the potential yield of their two soybean lines on salt-affected areas.

ECOFRIENDLY NATURAL DYE SYNTHESIS INSTEAD OF SYNTHETIC DYE FOR DYE SENSITIZED SOLAR CELLS

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The solar energy is one of the most important renewable energy resources. To convert this energy to electricity dye sensitized solar cells (DSSCs) have been studied recently. In these bio-photovoltaic cell systems generally synthetic dyes are used. However these dyes have some disadvantages for environment like toxicity, harmful waste products and decomposition feature. In a word, they are not ecofriendly.

In this study, as an alternative to synthetic dyes, natural dyes were produced from different fruits to be used in DSSCs. Especially the fruits with high anthocyanin content like wild cherry, black mulberry, raspberry and blackberry were preferred. Ultrasound was used for extraction of natural pigments in the fruits. After the fruits were grinded and specific amount of ethanol was added, they were subjected to 1 hour of extraction at 40°C in ultrasonic bath. The structural analysis of the extracts were carried out at five different pH conditions by Ultra Violet Visible Spectroscopy (UV-Vis), Fourier Transform Infrared Spectroscopy (FTIR) and Raman Spectroscopy, respectively. According to the results of UV-Vis Spectrophotometer, FTIR and Raman Spectroscopy, the highest amount of anthocyanin was found at pH 1. Wild cherries were evaluated as the best alternative to harmful synthetic dyes among all of the fruits.