An application of GIS to improve the nature route map in Phuwieng Nation Park for ecotourism

Student : Mr.Marut Surussawadee

Project advisor : Asst. Prof. Samang Homchien

Department of Environmental Science, Faculty of Science , Khon Kaen University. Thailand.

The objective of this study was to improve the nature route map for ecotourism and established database by using GPS and input more data of new attractive points. The data in GPS was inputed through Map Source Program after that it was taken to Arcview3.2a Program for implementation.The position of attractive points were read as UTM(Universal Transvers Mercator) from GPS(Global position system). The result shows 30 attractive points which included plants, animals,view point and 4 natural trails. All data were managed efficiently and can display before traveling.

Key word : GIS

An application of GIS to study land use in Tambol Banped, Khon Kaen Province.

Student : Mr. Ekkaluk Salukkham

Project advisor : Asst. Prof. Sam-ang Homchurn

Department of Environmental Science, Faculty of Science , Khon Kaen University. Thailand.

The Objectives of this study were to sort out and compute land use in Tambol Banped, Khon Kaen Province by using Geographic Information System. Quick Bird satellite images (2002) at scale of 1:50000 were interpreted by eyes then land use area was computed by using ArcView 3.2 program and the land use map was made. From the results, it was found that land use area could be divided into 5 major categories that were agricultural land which had an area of 13.18 square kilometers (29.15 percent of the entire area). Water resources had an area of 3.02 square kilometers (6.68 percent of the entire area). Urban and built up land had an area of 3.33 square kilometers (7.36 percent of the entire area). Forest had an area of 4.29 square kilometers (9.48 percent of the entire area) and Miscellaneous land had an area of 21.39 square kilometers (47.32 percent of the entire area). Agricultural land was divided into 3 minor categories that were paddy field which had an area of 12.67square kilometers (28.02 percent of the entire area), field crop had an area of 0.18 square kilometers (0.40 percent of the entire area), horticulture had an area of 0.33 square kilometers (0.73 percent of the entire area). Urban and built up land was divided into 5 minor categories that were City, town and commercial land which had an area of 1.56 square kilometers (3.45 percent of the entire area), institutional had an area of 0.34 square kilometers (0.75 percent of the entire area), industrial land had an area of 0.52 square kilometers (1.15 percent of the entire area), Khon Kaen airport had an area of 0.81 square kilometer (1.79 percent of the entire area) and public land had an area of 0.10 square kilometers (0.22 percent of the entire area). Forest was divided into 2 minor categories that were deciduous forest which had an area of 4.08 square kilometers (9.02 percent of the entire area) and forest plantation had an area of 0.21 square kilometers (0.46 percent of the entire area). Miscellaneous land was divided into 5 minor categories that were grass land which had an area of 0.42 square kilometers (0.93 percent of the entire area), bush and shrub had an area of 0.64 square kilometers (1.42 percent of the entire area), perennial had an area of 16.89 square kilometers (37.36 percent of the entire area) low land had an area of

2.40 square kilometers (5.31 percent of the entire area) and abandoned land had an area of 1.04 square kilometers (2.30 percent of the entire area)

Key word : Application of GIS

Analysis of Ambient Ozone Concentrations by Passive Sampling Technique in Khon Kaen Municipality

Student : Miss. Sarunya Thanasomrit

Project advisor : Asst. Prof. Turenjai Doolgindachbaporn

Department of Environmental Science, Faculty of Science , Khon Kaen University. Thailand.

Measurements of ambient concentrations of Ozone (O_3) in 3 Khon Kaen Municipal selected sensitive areas including Khon Kaen University Demonstration school (Modindaeng), Khon Kaen Wittayayon school, and Kanlayanawat school were carried out in 3 study periods as July 27, 2005 – August 5, 2005; August 27, 2005 – September 5, 2005 and September 26, 2005 – October 5, 2005 by means of Passive Sampling Technique, divided twice a day as day time and night time in 30 days. The result demonstrated that in Khon Kaen Municipal area, average concentrations of Ozone in day time was 22.32 ppbv which was higher than in night time (9.09 ppbv). In the 2^{nd} period of exposure, between the end of August and the beginning of September, average concentrations of Ozone was the highest and over the WHO 8 hours standard concentration which was more than 60 ppbv. Only in 1 day from Monday until Friday which were not rain, concentration of Ozone was higher than on Saturday and Sunday. The most of average concentration of Ozone in Khon Kaen University Demonstration school (Modindaeng) was higher than in another school, Khon Kaen Wittayayon school, and Kanlayanawat school. Moreover, the result shown that Passive Sampling Ozone concentrations were higher than in Continuous Automatic Active Sampling Ozone concentrations of Pollution Control Deparment. The result of Passive Sampling Technique in Kanlayanawat school was the highest related with the result of Active Sampling (r^2 = 0.88 – 0.99)

Key word : Ozone Concentrations

Efficiency of Water Lettuce and Duckweed in Removing Nitrogen and Phosphorus from Effluent of Khon kaen University Oxidation Ponds.

Student : Mr. Watcharapong Wararam

Project advisor : Associate Professor Kitti Akamphon

Department of Environmental Science, Faculty of Science , Khon Kaen University. Thailand.

In this research, efficiency of water lettuce (*Pistia stratiotes* Linn.) and duckweed (*Lemna perpusila* Torr.) with cover areas of 0, 25, 50 and 100% in removing nitrogen and phosphorus from the effluent of oxidation ponds of Khon Kaen University waste water treatment system was studied. The period of the research was 3 weeks and 3 replicates were used. The samples were collected and analyzed once a week. From the results, it was found that in week 2 and 3 of the experiment, water lettuce with 25, 50 and 100% cover areas could significantly reduce TKN value in the samples compared with control ($P < 0.05$), the percentages of reduction in week 2 were 81, 92 and 52 respectively, and in week 3 95, 98 and 84 respectively. Moreover, it was found that water lettuce with 50 and 100% cover areas could significantly reduce TKN value in the samples in week 1 ($P < 0.05$) with the percentages of reduction of 92 and 73, respectively. In addition, water lettuce with 25, 50 and 100% cover areas could also significantly reduce NO_3-N value of the samples in week 1 and 3 of the experiment with the percentages of reduction in week 1 of 28, 30 and 38 respectively, and in week 3 35, 52 and 45, respectively. Whereas in other treatments there were no significant differences in TKN, NO_3-N and P. Duckweed with 25, 50 and 100% cover areas could significantly reduce TKN value in the samples compared with control ($P < 0.05$) in week 2 and 3, the percentages of reduction in week 2 were 52, 70 and 85 respectively, and in week 3 68, 50 and 41 respectively. The significant reduction of NO_3-N value was detected in week 3 when the duckweed was used with 25, 50 and 100% cover areas, the percentages of reduction were 23, 21% and 48%, respectively. Moreover, duckweed with 25 and 50% cover area could significantly reduce NO_3-N value in week 1 ($P < 0.05$), the percentages of reduction were 28 and 17, respectively. Whereas in other treatments there were no significant differences in TKN, NO_3-N and P. In conclusion, water lettuce had higher efficiency in reducing TKN, NO_3-N and P than duckweed. The highest average ability of water lettuce in reducing TKN and NO_3-N was in week 3, whereas the highest ability in P reduction was in week 1

Key word : Duckweed

Elements of Carbonaceous Aerosol in rainy season at Ampher Phimai Changwat Nakhon Ratchasima

Student : Mr. Nattajak Ponvieng

Project advisor : Asst.prof. Turenjai Doolgindachabaporn

Department of Environmental Science, Faculty of Science , Khon Kaen University. Thailand.

Carbonaceous aerosol studied from July to September 2005 collected samples at The observatory for atmospheric research at Phimai Ampher Phimai Changwat NaKhon Ratchasima by Quartz fiber filter with NILU type cascade impactor. Carbonaceous aerosol were Organic Carbon(OC) and Elemental Carbon (EC) analyzed by Thermal analysis by HCN corder. Found that during collected samples in the west part of sampling site, there was Talad Kae-Phimai high way construction. And around the sampling site, there were plantation areas as cassava, sugar cane and rubber trees which were in progress of cultivated. Southwest wind blew 2-3 m/s. Average temperature was 25^{O}C. Average rainy days was 20 days/month and average rain amount was 278 mm/month. Found that sources of aerosol were from the Southwest. The average amount of both Fine particle aerosol and Coarse particle aerosol were 6.33 and 4.27 µg/m^{3}.The highest amount of aerosol were 7.29 and 6.73 µg/m^{3} in July. Amount of Organic Carbon(OC) and Elemental Carbon (EC) in Fine particle and Coarse particle were 30% and 21% and average OC/EC ratio were 1.2 and 1.9

Key word : Carbonaceous Aerosol

Factors Affecting Student's Behavior on Solid Waste Separation, Faculty of Science, Khon Kaen University

Student : Miss Jintana Sungkao

Project advisor : Asst. Prof. Dr. Adcharaporn Pagdee

Department of Environmental Science, Faculty of Science , Khon Kaen University. Thailand.

This survey-based study identifies factors affecting student's behavior in solid waste separation. The target population is a group of students from Faculty of Science, Khon Kaen University. In total, 338 students were sampled using a quota sampling technique. Students enrolled in the first semester, 2548 were asked to complete a questionnaire, covering background knowledge, attitudes, and experiences of separating solid wastes. The study shows that factors affecting student's behavior in solid waste separation include 1) educational background (Chi-square test of independence, p-value = 0.037), 2) family influence (p-value < 0.0001), 3) incentive for solid waste separation (p-value < 0.0001) e.g., additional income and score for consideration to continue staying in University's dormitories, and 4) influence from surrounding people such as friends and teachers (p-value < 0.0001). Finally, the survey indicates that approximately 86.6% of the sampled students obtain the highest understanding level of solid waste separation.

Key word : Solid Waste Separation

Household Solid Waste Manangement in Chaivaree Sub-district Municipality, Phochai District, Roi-Et Province.

Student : Miss Maliwan Shoosrimeg

Project advisor : Asst. Prof. Dr. Adcharaporn Pagdee

Department of Environmental Science, Faculty of Science , Khon Kaen University. Thailand.

This survey – based study is to identify types and components of household solid wastes. It is also to estimate quantity of solid wastes produced from households and describe household solid waste management in Chaivaree Sub- district Municipality, Phochai District, Roi – Et Province. The survey was conducted in August – September 2005. One hundred household representatives were selected, using a convenient sampling method. The study shows that the majority of solid wastes come from cooking process (80% of the respondents reported). An average amount of household solid wastes is 0.32 kg/person/day of which the majority is garbage : 0.23 kg/person/day, encompassing of left-over food, vegetables and fruits, followed by rubbish 0.09 kg/person/day, including plastic, leafs and plastic bottles, and hazardous wastes, which is less than 50 g/person/day (e.g., lamp and battery). Approximately 86% of the sampled households reported of having a household garbage container. About 58% of households reported that they separated solid wastes that could be reused and recycled before dumping. This group of households explained that the main reason for separation is for sale (77.59%) and reuse (8.62%), because these solid wastes can generate additional family income and reduce household expenses. The three most frequently reported solid wastes that households reused include plastic bottles (53%), plastic bags (34%) and fertilizer bags (20%). For solid waste management, 52% of the sampled households reported that all of their household solid wastes were managed by the Chaivaree Municipality, while 48% reported that they took care of their own solid wastes. The method that households most frequently used is to gather all wastes at one spot and then burn (75%).

Key word : Household Solid Waste Manangement

Level of Heavy Metals in Wastewater Discharged into Khon Kaen University Wastewater Treatment System.

Student : Mr.Theerachai Chingchana

Project advisor : Associate Professor Kitti Akamphon

Department of Environmental Science, Faculty of Science , Khon Kaen University. Thailand.

The object of this research is to measure the level of 5 heavy metals that were lead(Pb), cadmium(Cd), cromium(Cr), zinc(Zn) and manganese(Mn) contaminated in wastewater from Srinakarin hospital, the building and laboratory, the lodging, the apartment and the dormitory of health science center precinct. In the 2 months period of study (July to August 2005) , the samples were collected 4 times at the inlet point of Khon Kaen University Wastewater Treatment System part I and analyzed by Flame Atomic Absorption Spectrophotometry technique. From the results, it was found that there were no Lead and Cadmium in the samples, while manganese, zinc and cromium were found in the range of 0.3090-0.5495 mg/l , 0.0763-0.1762 mg/l and 0.0060-0.0123 mg/l , respectively. Manganese and zinc concentration were found to be highest in the second collection whereas cromium found to be highest in the fourth collection. However, the level of all heavy metals studied in this research were not higher than the effluence standard.

Key word : Heavy Metals

Levels of Nitrogen and Phosphorus KKU's Constructed Wetlands and Oxidation Pond Wastewater.

Student : Miss Hatainut Sritaweekart

Project advisor : Associate Professor Kitti Akamphon

Department of Environmental Science, Faculty of Science , Khon Kaen University. Thailand.

Level of Nitrogen and Phosphorus in influent and effluent of KKU's Constructed Wetlands and Oxidation Pond were investigated during November and December 2005. Parameters analysed include Nitrite-N, Nitrate-N, TKN and Phosphorus. The results showed that the levels of Nitrite-N in all water samples were not detectable. The levels of Nitrate-N, TKN and Phosphorus in influent and effluent of Constructed Wetlands were 0.74 ± 0.08 mg/l, 10.03 ± 0.68 mg/l, 2.55 ± 0.18 mg/l and 0.57 ± 0.03 mg/l, 2.60 ± 0.46 mg/l, 2.46 ± 0.08 mg/l ; respectively. And the levels of Nitrate-N, TKN and Phosphorus in influent and effluent of Oxidation Pond were 2.22 ± 0.25 mg/l, 4.16 ± 0.62 mg/l, 5.04 ± 0.22 mg/l and 0.69 ± 0.03 mg/l, 1.37 ± 0.13 mg/l, 1.55 ± 0.70 mg/l ; respectively.

Key word : Constructed Wetlands

Potential of Briquetted Fuel made from Biomass as Substituted Fuel for Charcoal.

Student : Miss Tiwagorn Intarakamhaeng

Project advisor : Asst. Prof. Dr.Adcharaporn Pagdee

Department of Environmental Science, Faculty of Science , Khon Kaen University. Thailand.

This study is to preliminarily evaluate the potential of briquetted made from biomass, including sawdust, corncob, and bamboo join as substituted fuel for eucalyptus wood – made charcoal. Five parameters: calorific value (J/g), ash content (%), moisture content (%), time spent to heat one liter of water to a boiling point (minute), and burning time (minute) were used to indicate the potential of the selected briquetted to become substituted fuel, coupled with local market prices offered in the Khon Kaen Municipality area.

According to the study result, sawdust – made briquetted is considered the most potential alternative fuel for charcoal with calorific value (J/g), ash content (%), moisture content (%), time spent to heat one liter of water to boiling point (minute), and burning time (minute) as follows: 18,567.88 J/g, 2.61 %, 3.97 %, 5.53 min, and 74.40 min respectively. These parameters for corncob – made briquetted are 17,186.97 J/g, 3.53 %, 7.22 %, 11.32 min and 91.20 min respectively, and for bamboo join – made briquetted are 16,607.76 J/g, 3.69 %, 7.44 %, 12.13 min and 80.40 min respectively. Simultaneously, eucalyptus wood – made charcoal obtains values of these parameters as follows: 21,661.79 J/g, 4.40 %, 5.78 %, 5.17 min, and 90.00 min respectively. Additionally, from the market survey, prices of sawdust – made, corncob – made and bamboo join – made briquettde and eucalyptus wood – made charcoal are 14 Baht, 12 Baht, 12 Baht, and 13 – 15 Baht respectively. From the study, it can be concluded that sawdust – made briquetted has the potential to become alternative fuel but yet substituted fuel for eucalyptus wood – made charcoal. It represents the value added product made from left – over biomass although some of its fuel properties i.e. calorific value, boiling time and burning time are smaller than ones from eucalyptus wood – made charcoal.

Key word : Biomass

Problems and obstacles of ISO 14001 implementation in certified organization in Khon Kaen province.

Student : Mr. Suphachai Polsamak

Project advisor : Assoc.Prof.Kitti Akamphon

Department of Environmental Science, Faculty of Science , Khon Kaen University. Thailand.

This study is focused on problems and obstacles of ISO 14001 Implementation and inadequate support from the government or related organization of three certified organizations namely PTT PCL.; Adams International Ltd.; and K C Rice Ltd. The methods used included interviewing and observing relevant people and related documents and activities.

The study has shown that all organizations though certified, have problems and obstacles in implementing ISO 14001. The magnitudes of problems and obstacles range from minimum to moderate levels, which implies that the organizations can manage the systems to the extent of their capabilities. Main problems and obstacles are inability to define and understand the requirements of ISO 14001, ineffective collaboration of employees in implementing the system , lack of awareness and encouragement of employees, lacking knowledge on environment and environmental management system, and employers' and employees' lack of motivation. Therefore, the certified organizations studied require supports from the government or related organizations are knowledge in ISO 14001, environment economic and social privileges and funding for ISO 14001 implementation.

Key word : ISO 14001

Species Diversity of Mushroom during rainy season on Education Nature Trail in Khaoyai National Park , Nakhonratchasima Province.

Student : Miss Jitwadee Hhoonwongsa

Project advisor : Asst. Prof. Samang Homchuen

Department of Environmental Science, Faculty of Science , Khon Kaen University. Thailand.

The study of species diversity of mushroom on Educational nature trail at Khaoyai National Park was conducted in rainy season during july to September 2005. 70 species had been found . They were classified into 14 groups from their morphology.There are 9 species of cup fungi , 4 species of dead ' man finger fungi , 27 species of gill fungi , 1 species of bolete fungi , 12 species are polypore fungi , 2 species of crust and parchment fungi , 5 species of coral fungi , 1 species of cantharellus fungi , 1 of jelly fungi , 1 species of stinkhorn fungi , 1 species of bird ' nest fungi , 1 species of puff ball fungi , 1 species of earth star fungi and 1 species of kernel fungi . In taxonomic system , these mushrooms can be classified in 21 order and 27 families . However there are only 40 species can be identified to species and 3 species can not be able to identify into any group . Edible mushroom are 17 species . Non edible species are 53 .

Key word : Mushroom

Species and Amount of Animals that Dead by Road Kill in Khon Kaen University

Student : Mr. Kittikun Phol-Armat

Project advisor : Asst. Prof. Dr. Penprapha Petcharabooranin

Department of Environmental Science, Faculty of Science , Khon Kaen University. Thailand.

The studies of Species and Amount of Animals that Dead by Road Kill in Khon Kaen University found the dead animal 17 species and amount is 266. The most dead animal is Toads (Order Anura) amount is 162. 60.9 %. And the least dead animal are grasshopper (Order Orthoptera) and Bats (Order Chiroptera) both 1 die, 0.4 %. And the study of factor which can relate to amount of dead animal are number of car in weekdays, length of roads and area of roads by statistical program SPSS 13.0 for windows found that length of roads relate to amount of dead animal the most $r = 0.392$, sig.=0.048 that less than 0.05, relation is significant. The second is number of car in weekdays $r = 0.318$, sig.=0.113 that more than 0.05, relation is non-significant varied. But the area of roads $r = -0.157$, sig.=0.445, the relation is non-significant unvaried. The amount of died animals in road from Faculty of Fine and Applied Art to Faculty of Associated Medical Science is 3.38×10^{-4} per area of road 1 m^3 and road from Shooting Field to Si-Tarn Swamp is 3.03×10^{-3} per 1 car. This studies are one kind of environmental indicator and can apply for several applications such as environmental impact assessment in biological, environmental management, transportation system planning and be the data for common sense to natural conservation.

Key word : Road Kill

Species Diversity of Birds on Khon Kaen University.

Student : Mr.Atirat Rachjaroen

Project advisor : Asst. Prof. Dr. Acharaporn Pagdee

Department of Environmental Science, Faculty of Science , Khon Kaen University. Thailand.

The primary objective of this study is to survey bird species on Khon Kaen University campus using the McKinnon List. It is also to preliminarily examine the relationship between species diversity and habitat characteristics. Four main habitat, including forest, agricultural area, marsh and pond, and residential zone were surveyed. Each of the habitat was divide into two site. The survey was conducted in two periods. The first one began in July 2005 and ended in September 2005 (rain season sample). The second period was done from November 2005 to January 2006 (winter season sample). The survey started from 6.00-8.30 am and from 4.00-6.00 pm in the afternoon every Thursday, Saturday and Sunday. In total, 81 bird species, classified into 36 families, including 55 resident bird species, 25 winter visitor species, and one passage migrant were observed. The common bird species found is in Sylviidae Family, consisting of 10 species. From the observed bird list , 77 species are considered protected species. Furthermore, RomklaoKaLaPaPrueg Park and The faculty of agriculture and the faculty of science area are the most similar (Sorensen 's index = 76.19)

Key word : Species Diversity, Birds

Species Diversity of Undergrowth Plants in Khon Kaen University.

Student : Miss Pornpimon Wongsuwan

Project advisor : Assistant Professor Samang Homchuen

Department of Environmental Science, Faculty of Science , Khon Kaen University. Thailand.

The study of Undergrowth Plants Diversity within Khon Kaen University, mainly consists of dry dipterocarp forest. The main objective of this study is to compile a checklist of undergrowth plants and explore their ethnobotanical information.The List Quadrat Technique was applied for plant collection. The plant specimens were collected from July to September 2005, 79 species, 72 genera, 46 families of undergrowth plants were found. A total of this were enumerated with one species each of gymnosperm, 12 species (9 genera 5 families) of monocotyledonase and 66 species (62 genera 40 families) of dicotyledonase. Number of Euphobiaceae were the greatest in number (6 species)

Key word : Undergrowth Plants

Study of the Potential of Nongprajuk Public Park as recreational tourist place at Udonthani

Student : Miss Prapasri Aulkit

Project advisor : Asst. Prof. Dr. Penprapa Petcharaburanin

Department of Environmental Science, Faculty of Science , Khon Kaen University. Thailand.

Recreational touristic Potential evaluation of Nongprajuk Public Park, Udonthani was conducted Weighting Score Method which was uesd for evaluation whit the 6 criteras included thansportation, tourisable supportation, importance and attention, tourist timeable, group of tourist attaction and safety. The futher informations included 3 copies to background situation informations and 123 copies of tourist interviewed informations.The results demonstated that there were about 48.5% of men and about 58.5% of women had interviewed.There were the highest percentage of students about 50%. Acconding ot the serveys, about 82% of tourist were traveled and relaxed. The revisory were lavatory and brochure that advise tour place defined as 31% and 24%. 100% of tourist were had an opinion to come back again.From potential evaluate of Nongprajuk Public Park show thansportation, tourist timeable, group of tourist attaction and safety were high potential.Tourisable supportation was moderate potential.Importance and attention were low potential. Potential evaluate of Nongprajuk Public Park equal 2.27, which could be classified as high potential and was main recreational place, means Nongprajuk Public Park is the first choice of recreational place that tourist always take into a consideration.

Key word : Recreational touristic

The Effect of Liquid Biofertilizer to The Quantity of Inorganic Nitrogen and Soluble Phosphorous in Soil.

Student : Miss Ruchira Srichangwang

Project advisor : Asst.prof.Dr.Pisit Chareonsudjai

Department of Environmental Science, Faculty of Science , Khon Kaen University. Thailand.

The study of effect of liquid biofertilizer to the quantity of inorganic nitrogen and soluble phosphorous in soil. This experiment was divided 4 treatment 3 replication : first treatment was a control, second treatment had a dilute rate of biofertilizer (1:1000), third treatment had a dilute rate of biofertilizer (1:500) and fourth treatment had a dilute rate of biofertilizer (1:250). Then analyzed to find the quantity of inorganic nitrogen and soluble phosphorous in soil. The result showed that all of dilute inorganic Nitrogen concentrate treatment were different non significantly ($p>0.05$), and the concentrations were showing between 0.429-0.691 ppm and 0.308 – 0.602 ppm at the period of 1 and 9 days respectively. Furthermore, soluble phosphorous in soil at a dilute rate of biofertilizer (1:250) and a dilute rate of biofertilizer (1:500) were different significantly ($p<0.05$) that between 2.150-3.787 ppm at the period of 1-4 days and 0.125-1.950 ppm at the period of 5-10 days.

Key word : Biofertilizer

The Analysis cadmium copper and lead in various fish from Pong River.

Student : Miss Kamolphan pakirana

Project advisor : Asst. Prof. Dr. Phenprapha Phetcharaburanin

Department of Environmental Science, Faculty of Science , Khon Kaen University. Thailand.

Cadmium, copper, and lead from three species of fish,i.e. common Smith ` barb *(Puntioplites protozsron),* common *Irilidescent mystus (Mystus multiradiatus)* and common Jullien's mud carp *(Henicorhynchus siamensis)* from Pong River. The fish samples were colllected during July September 2001 and analyzed for heavy metal using atomic absorption spectrophotometer. The results revealed that the content of the metals in mg/kg wet weight were as follow; cadmium was varied from 0.392±0.023 to 1.231±0.037 mg/kg, copper from 0.895±0.012 to 4.525±0.012 mg/kg and lead from 1.878±0.016 to 5.001±0.428mg/kg. The highest levels of cadmium, copper and lead found in Smith ` barb and the lowest levels of cadmium, copper and lead found in Jullien's mud carp. All of fish species tested are probably safe to consume.

Key word : Analysis cadmium copper and lead

The Analysis of Electronic Waste Flowchart : mobile phones and batteries at the Department of Environmental Science,Faculty of Science, Khon Kaen University.

Student : Miss Panutda Kummburngkang

Project advisor : Asst. Prof. Dr. Adcharaporn Pagdee

Department of Environmental Science, Faculty of Science , Khon Kaen University. Thailand.

This survey-based study analyzes the flowchart of electronic wastes, including mobile phones snd batteries. It also examines amounts of electronic wastes produced by students, faculty members and supporting staff members at the Department of Environmental Science, Faculty of Science, Khonkaen University. Finally, the study investigates of how these wastes are being treated. The survay was conducted in August 2005, with 184 self-administered questionnaires distributed to all students, faculty members, and supporting staff members. In total, 143 questionnaires were returned. The majority of respondents are students(95.80%), followed by faculty members(2.10%) and supporting staff members(2.10%). The survey presents that 206 mobile phones and 184 batteries are currently in use. From the survey, 83 mobile phones and 67 batteries were reported no longer in use therefore considered electronic wastes.For mobile phones, these electronic wastes classified not being treated at all include 32.53% being stored with users and 1.20% dumped with other regular wastes. At the same time, the electronic wastes being treated include 30.12% gave away to people e.g.,friends and family member,26.50% sold to mobile phones shops,and 8.43% sold to other users. For batteries,the majority of respondents reported not treating non-used batteries at all, including 79.10% of the batteries being stored and 8.95% dumped to regular waste containers. Only 5.94% of batteries were dumped in hazard waste containers and 4.47% returned the batteries to dealers.

Key word : Electronic Waste, Mobile phones and Batteries

The Effect of Liquid Biofertilizer to Microbial Biomass on Soil and Growth of Morning Glory .

Student : Miss Phatchanee Srinapang

Project advisor : Assist.Prof.Dr. Phisit Charearnsutjai

Department of Environmental Science, Faculty of Science , Khon Kaen University. Thailand.

This project was aimed to study effect of liquid biofertilizer to microbial biomass in soil and growth rate of morning glory. Experimental units were set in Randomized Complete Block Design (RCBD) with 3 repeats. They were control unit, liquid biofertilizer dilution unit as 1:1000, 1:500 and 1:250. Microbial biomass in soil were analyzed by soil sampling on day 0, 2, 4, 6, 12 and 19 respectively. Morning glory growth rate were measured and recorded every 4 days in experimental period. The results of liquid biofertilizer effect on microbial biomass demonstrated that microbial biomass quantity in soil were significant statistically different ($p<0.0005$). The highest microbial biomass was the unit with 1:250 dilution of liquid biofertilizer. 1:500 and 1:1000 dilution of liquid biofertilizer were subsequently lower and the lowest was control unit. The result of liquid biofertilizer effect on morning glory growth rate shown that height, diameter of stem, number of leaves, length of root, flesh weight and dried weight were significant statistically different ($p<0.0005$). The highest growth rate was the unit with 1:1000 dilution of liquid biofertilizer. 1:500 and 1:250 dilution of liquid biofertilizer were lower respectively. The lowest was the control unit.

Key word : Liquid Biofertilizer

Touristic Potential evaluation of traveling site in Khao kho distric Petchaboon.

Student : Miss Kitima Ratchatawetchakul

Project advisor : Asst. Prof. Dr. Penprapa Petcharaburanin

Department of Environmental Science, Faculty of Science , Khon Kaen University. Thailand.

Touristic Potential evaluation of traveling site in Khao kho distric Petchaboon. There were individually 7 traveling sites Pratamnak Khao kho,Praborommatatjedikanjanapisek, Anusornsatanpusiasala Khao kho, Itti weapon museum, Khao kho iternational library, Jedipraborommasaririggathat Khao kho. Weighting Score method was used for evaluation with 6 criterias included by the parameter included transportation,touritable supportation,importance and attraction, tourist timeable, group of tourist attraction and safety. The further informartions included 7 copies of background situation information amd 143 copies of tourist interviewed informations. The results demonstrated that there were about 49 % of men and about 51% of women had interviewed. There were the same highest percentage of the 2 occupations, government servant and employee, about 31% . According to the servays, about 94% of tourists were traveled and relaxed. The revisory topics were conservations, safety and cleaners defined as 16%, 15% and 15% respectively . About 99% of tourists were had an opinion to come back again. The results of this evaluation shown the hight touristic potential in these 6 criterias,means Khao kho is the first choice of touring place that tourist always take into a consideration.

Key word : Potential evaluation

Use of Non-timber Forest Products harvested from Dong Namon Community Forest, Khampai village, Rongkham District, Kalasin Province.

Student : Miss Kanuengnit Suwanasing

Project advisor : Asst. Prof. Dr. Adcharaporn Pagdee

Department of Environmental Science, Faculty of Science , Khon Kaen University. Thailand.

This survey-based study investigates use of Dong Namon Community Forest, Khampai village, Rongkham district, Kalasin province. The use is focused on harvesting of non-timber forest products (NTFPs). The study is also to estimate net economic benefits of NTFPs harvested by local villagers. The survey took place from July to September, 2005. In total, 50 household representatives were selected for a personal interview, following questionnaire questions, which cover use of the Community Forest, harvesting of NTFPs, management of Community Forest, and demographic information. According to the survey result, 76% of households reported that they harvested NTFPs for household use and income generation. These NTFPs frequently harvested include mushrooms (100% of households reported harvesting), wild vegetable — Siam tulip (39.5%), ant eggs (23.7%), wild vegetable — elephant yam (13.2%), insects (13.2%), and fuelwood (13.2%). Total amounts of NTFPs harvested by villagers are as follows: mushrooms 7,100.2 kg , wild vegetable — Siam tulip 877.5 kg , ant eggs 228.6 kg , wild vegetable — elephant yam 63.9 kg , insects 17.2 kg , and fuelwood 2,544 kg. The net economic benefit of these NTFPs is 410,191 Baht in the studied year (2005). The actual income generated and brought to local economy from selling NTFPs of some villagers (60.53% of the total number of households) is approximately 86,780 Baht.

Key word : Forest Products

Utilization of Water Flea (*Moina macrocopa* Straus.) for Reducing Suspended Solids from Effluent of Oxidation Ponds.

Student : Miss Sununta Sastrakom

Project advisor : Associate Professor Kitti Akamphon

Department of Environmental Science, Faculty of Science , Khon Kaen University. Thailand.

The objective of this study was to utilize water flea (*Moina macrocopa* Straus.) in reducing suspended solids from oxidation ponds effluent. The procedure was divided into two parts. Firstly, preliminary number test had been done by adding into each treatment water fleas amount to 0 (control), 100, 1,000, 10,000 and 100,000 per 200 ml. of effluent. Secondly, definite number test was done by adding into each treatment water fleas amount to 0 (control), 5,000, 15,000, 25,000, 35,000 and 45,000 per 200 ml. of effluent and observed for 4 days. Analyzed weight of suspended solids by Gravimetric Method. The result from the first part indicated that water fleas amount to 10,000 cells per 200 ml. had the highest ability in reducing suspended solids of the effluent. The average suspended solids in this treatment was 37.2 mg/l while that of control was 44.19 mg/l. And from the second part, the experiment showed that water fleas amount to 15,000 cells per 200 ml. had the highest suspended solids reducing efficiency at day 4 where it's ability was significantly higher than control. The average suspended solids of this treatment was 20.00 mg/l. while that of control was 46.00 mg/l. This investigation showed that water fleas could effectively reduce suspended solids from oxidation ponds effluent.

Key word : Water Flea

Water soluble aerosol in rainy season in Phimai district Nakhonratchasima Province.

Student : Mr. Jaturong sanesorn

Project advisor : Asst. Prof. Turenjai Dooljindachabaporn

Department of Environmental Science, Faculty of Science , Khon Kaen University. Thailand.

This project was aimed to study water soluble aerosol . Samples were collected between July to September, 2005 at The observatory for atmospheric research at Phimai Phimai district Nakhonratchasima Province by means of NILU type cascade impactor methode with use of polyflon filter. 8 water soluble aerosol were analyzed by Ion chromatography (Dionex - 120). Aerosol can be divided as fine particle (d < 2.5 μm) and coarse particle (2.5 μm < d < 10 μm). As according to this study, around sampling site, there were plantation area as cassava, sugar can and rubber tree which were in progress of cultivated preparation. There was southwest wind blowing 2-3 metrepersecond, the temperature average was 20 degree of celsius, rain average amount was 278 millimetre, rain average 20 days. during sampling period, there was Talad Kae – Phimai highway construction in the west part of sampling site. In fine particle, the average amount of SO_4^{2-} was the highest, 2.15 μm/m^3. In coarse particle, the average amount of NO_3^- was the highest, 0.88 μm/m^3. 8 water soluble aerosol component Na^+, NH_4^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, NO_3^- and SO_4^{2-} In fine and coarse particle the average amount were 0.12, 0.83, 0.12, 0.06, 0.03, 0.02, 0.14, 2.15 and 0.33, 0, 0.03, 013, 0.05, 0.37, 0.88, 0.31 μg/m^3 respectively.

Key word : Water soluble aerosol