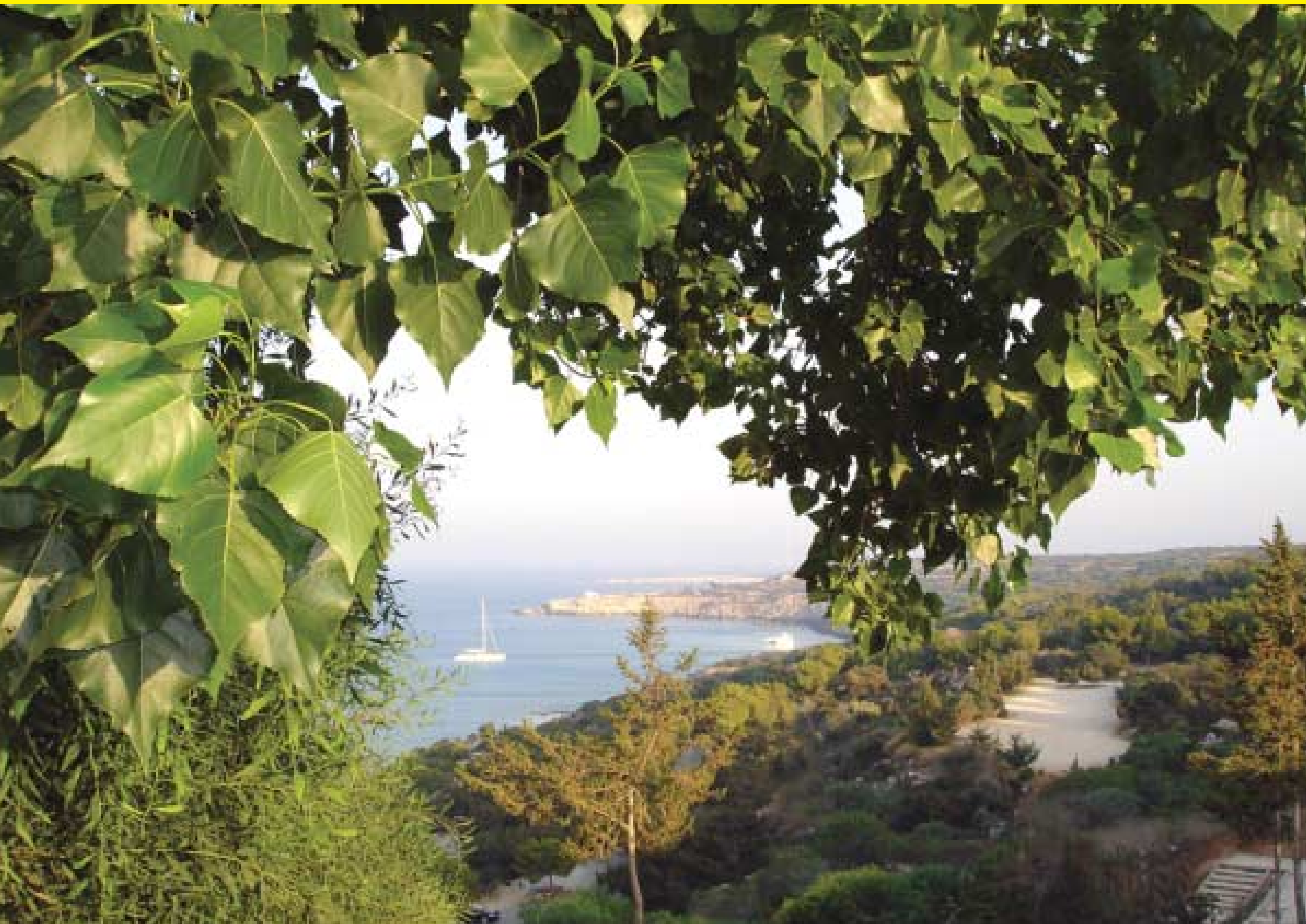
E&HI Volume 9 No. 1 2007

ISSN 1726-9210

Environment and Health International

Magazine of the International Federation of Environmental Health (On-line version)



INTERNATIONAL FEDERATION OF ENVIRONMENTAL HEALTH

President – Colm Smyth, Ireland

President, Colm Smyth, Ireland

President Elect, Bernard J Forteath, Scotland

Hon. Secretary, Ray Ellard, Ireland

Hon. Editor, John Stirling, Scotland

Webmasters, Henning Hansen and
Jan Joergensen, Denmark

Archivist, Mike Halls, Scotland
Hon. Public Relations Officer, Kia Regner, Sweden

Cover Photographs:

Upper. The Grand Harbour of Malta by night - Hadrian Bonello

Lower. View over a bay in Cyprus - Bernard Forteath

Back cover photographs

Upper. View of Cyprus - Bernard Forteath

Lower. The Valetta Waterfront - Hadrian Bonello

The views expressed in this magazine are not necessarily the views of the International Federation of Environmental Health

IFEH REGISTERED OFFICE
Chadwick Court
15 Hatfields, London, UK SE1 8DJ
www.ifeh.org

CONTENTS

Many thanks to all contributors to this issue of Environment and Health International

Deadline for submission of articles for the next issue is

1st September 2007

The Hon. Editor, John Stirling, can be contacted at
11 Muirwood Drive, Currie
Edinburgh EH14 5EZ
SCOTLAND
e-mail: j.stirling@btinternet.com

Volume 8 Number 2 – Correction

Please note that the author had inadvertently omitted the names of his supervisors, the heading should of course read as follows

Kitagwa, William G.[1], Bekker Johan L.[2] and Onyango, Rosebealla O.[3]
1 Moi University, Department of Environmental Health, Eldoret, Kenya
2 Tshwane University of Technology, Department of Environmental Health, Pretoria, South Africa
3 Maseno University, School of Public Health and Community Development, Maseno, Kenya

Environmental Health Sustainability Indicators: A Lesson from History

By Fred O'Brien, Honorary Vice President IFEH

The exploits and achievements of great men and women spur us on to greater effort. Their contribution to the public good is like the proverbial "breath of fresh air". John Graunt, the father of health statistics, was such a person. His analysis of the London Bills of Mortality in 1662 enabled him to demonstrate successfully four of the most important facts that vital statistics disclosed. First, he made clear that there was a certain regularity in the occurrence of phenomena, which, considered independently, may appear to be merely the play of chance. Secondly, he pointed out that there was always an excess of male births over female births, but that in the population alive at any time, the number of the two sexes was approximately equal. Thirdly, he showed that the mortality rate was relatively high in the earliest years of life. And, finally, he found that the death rate in cities was then higher than in rural areas. William Petty was a great friend of John Graunt, learned from him, attended his funeral and conducted important research in Dublin after Graunt's death. In Petty's Observations Upon the Dublin Bills of Mortality, a recommendation is made to ensuring accurate and complete data, the importance of improving data collection in Dublin, and he indicates that *"an eight or ten pound per annum surcharge would make the Bills of Dublin to exceed all others, and become an excellent Instrument of Government."*

Petty, following on from Graunt, categorized years as *"healthful"* and *"sickly"* and, on the basis of his analysis of the Dublin Bills, selected 1641 as the *"Standard of Health"*. He ventured to make a *"standard of the healthfulness of the air"* and the *"wholesomeness of the food"* from the data on disease.

The Bills of Mortality were introduced during the previous century and were weekly compilations of the burials, baptisms and marriages recorded in each parish. Graunt described the mechanism of collection of the data in the following words:

> *"When any one dies, then, either by tolling or ringing of a bell, or by bespeaking of a grave of the sexton, the same is known to the searchers, corresponding with the said sexton:*
> *"The searchers hereupon (who are ancient matrons sworn to their office) repair to the place where the dead corpse lies, and by view of the same, and by other enquiries, they examine by what disease or casualty the corpse died. Hereupon they make their report to the parish clerk, and he, every Tuesday night carries in an accompt of all the burials and christenings happening that week to the Clerk of Hall. On Wednesday the general accompt is made up and printed, and on Thursday published and dispersed to several families who will pay four shillings per annum for it."*

John Graunt saw in the Bills a message for posterity and so began a process without which all public health must remain in the dark. William Farr, Compiler of Abstracts to the General Register Officer, remarked some two centuries later *"vague conjecture began to be replaced by numerical expression."* Graunt was obviously a man of broad vision and sound judgement and saw the potential in his new "statistics" of application in relation to the impact of environmental factors on the public health.

This ability to recognize the value of environmental health data and to gather and use data, as a means to planning and evaluating environmental health services is very much needed today. The International Federation of Environmental Health (IFEH) has moved in addressing this need in a comprehensive way by establishing its World-wide Sustainability Indicator Project. Additionally, IFEH has entered into a Memorandum of Understanding with the International Institute for Sustainable Development (IISD) and is working co-operatively with IISD on the Institute's Compendium of Sustainable Development Indicator Initiatives that closely links to the global environmental health goals of the Federation.

Resolutions made by those attending the 8th World Congress on Environmental Health, Durban, South Africa 2004

By Kia Regnér IFEH PRO
Email: kia@telia.com

During this event the delegates discussed and decided on some major issues of importance to environmental health practitioners. These are presented below.

It must be understood that the views expressed are not necessarily the official views of IFEH but express the ideas and beliefs of those present at the Congress. The points are of course also more or less relevant in different countries or contexts. Some of IFEH's individual members are working to a large extent with environment protection issues and others with health protection. What primarily binds us together is our common understanding of the need to see environment and health as closely interlinked and necessary to both be included in our work towards a sustainable world.

Some of the issues will be discussed further and on a broader base and developed into policy papers. This is already the case with Policy Impact Assessment and Climate Change. These have been developed into Policy Paper no. 8 on Sustainability Indicators, which is also an IFEH broad ranging project, and Policy Paper no. 9 on Climate Change. These can be found on the IFEH web site.

It would be interesting if those of you who read this would like to make comments on the issues raised and to send them on to John Stirling, the editor of this magazine or to myself as listed below.

Role of Environmental Health Practitioners

- Environmental health practitioners should be committed to: (1) advocating for the right to a healthy environment; (2) working within the institutional framework and partnering with stakeholders to enhance environmental health; (3) developing and reforming policies and legislation to provide a healthy environment; and (4) incorporating these principles and ethics as part of their professional goals.

Environmental Health Agencies

- As environmental health programs affect multiple departments and jurisdictions, and involve multiple competencies, a coordinated response by governmental agencies is needed.
- Environmental justice demands that interventions including legislation, education and specific resources should be provided or developed to build capacity, competencies and opportunities, specifically targeting women, minorities and disadvantaged groups.

Policy Impact Assessment

- All organisations (government and industry) should develop performance criteria and tools to assess their impacts on society, public health and the environment.

- Environmental health impact assessments, environmental standards and guidelines should be submitted to a transparent, independent and credible peer-review process prior to acceptance or implementation.

.

Environmental Hazards

- Materials, processes and products which damage health or the environment should be controlled or phased-out so as to eliminate harmful exposure.

- Affordable appliances or stoves that minimise air pollution (both indoor and outdoor) should be developed and their use promoted as an alternative to the use of solid fuels or kerosene or paraffin cookers.

- To protect public health (especially with regard to vulnerable populations), emission and ambient standards to control pollutants should be developed within an agreed time schedule.

Climate Change

- Government, academia and community groups, especially in developing countries, should evaluate the environmental and health consequences of global climate change and develop a response strategy.

Water

- Accessible and affordable supplies of safe water and sanitation should be provided by 2015 for all communities, particularly the poor and/or disadvantaged.

Genetically Modified Food

- There is a need for
- an effective and appropriate management system to ensure the safety of GMOs, maintain food security,
- public education
- and labelling of genetically modified foods to provide consumers with credible information and the ability to make informed choices.

Waste Management

- Because incineration of health care waste produces persistent toxic substances, incineration, as currently practised, contravenes the Stockholm Convention aimed at eliminating these substances. The continued availability of incinerators inhibits the development and use of alternatives, hence international organizations and governments should provide a scheduled phase-out of existing health care waste incinerators, place a moratorium on the permitting/licensing of new units, and promote safer waste disposal options.

Land Use Planning

- Recognizing the costs and health consequences of unplanned urbanization, including migration, there is a need for enhanced planning, infrastructure development, pollution control, and other processes to protect and enhance environmental and public health and the quality of life, so as to accommodate growth and economic development in both cities and rural communities.

Participation in IFEH World Congress on Environmental Health

- Noting that environmental health involves the whole community, members of communities should be provided with the opportunity to participate meaningfully in future IFEH Congresses. They should also have the opportunity to attend Congresses and to obtain IFEH publications at reasonable cost. Future Congresses should devote sessions to research, which reflects the involvement of communities in environmental health.

- To encourage student participation and provide educational opportunities, student attendance at IFEH Congresses should be encouraged by minimal conference fees, scholarships to attend, student awards, and student sessions.

Deadline for submission of articles for the next issue is

1st September 2007

Contact
John Stirling
11 Muirwood Drive, Currie
Edinburgh EH14 5EZ
SCOTLAND

e-mail: j.stirling@btinternet.com

Sustainability Indicators Initiative

INVITATION TO CONTRIBUTE TO THE COMPENDIUM: A global directory of sustainability indicator initiatives

By Henning Hansen, EnviNa Denmark, Coordinator of the IFEH Sustainability Indicators Initiative Working Group

The International Federation of Environmental Health (IFEH) has entered into collaboration with the International Institute for Sustainable Development (IISD www.iisd.org) with the aim of collecting, disseminating and promoting the use of indicators to monitor and assess progress towards sustainable development.

The International Institute for Sustainable Development (IISD) has housed the *Compendium of Sustainable Development Indicator Initiatives* since 1995 and the International Federation of Environmental Health has since 2000 been running a project on sustainability indicator initiatives. As a result of our co-operation with the IISD it has been decided to use the Compendium as the common database on indicator initiatives.

We would like to invite your organisation / institution to join the Compendium. Your organisation's / institution's indicator initiatives would be a valuable addition as other organisations and institutions such as yours and involved in similar activities would benefit from learning about your work. The IISD together with the IFEH have been invited to present a paper on the Compendium at an OECD World Summit in June 2007, Istanbul, which we have accepted. Any contribution from your organisation to the Compendium will be an added value to the success of the presentation at the OECD World Summit.

You can add information on your indicator initiative(s) with a broad focus on sustainability and environmental health and protection or just browse initiatives already included in the Compendium from both the IFEH and IISD websites:

IFEH: www.ifeh.org/indicators/compendium
IISD: www.iisd.org/measure/compendium

By contributing, you can help to:

… Improve how to measure progress towards sustainability
… Share your experience with other institutions involved in similar indicator efforts throughout the World

… Track the organizations / institutions which are innovating in this field
… Facilitate the coordination of sustainability indicator initiatives worldwide
… Keep your organisation in touch and informed

With more than 800 entries, the Compendium is one of the most extensive sources of information on sustainable development indicator initiatives around the world. Entries in the Compendium are created by practitioners, for practitioners with the Compendium website receiving more than 1000 visits per month.

Access to the Compendium is free and it aims at reaching and motivating the widest audience possible. Practitioners save time and resources, enabling them to stay current and avoid duplication.

Over the years, the Compendium has benefited from the collaboration and support of organizations such as Environment Canada, UN Commission for Sustainable Development, World Bank, Redefining Progress, the IFEH and others.

As you are in the best position to provide information on your organisation / institution and its work, we urge you to take a few minutes to create an entry in the Compendium and join the growing network of sustainable development measurement practitioners. Just follow the link below to add your initiative: www.iisd.org/measure/compendium/addinitiative.aspx

The IFEH is willing to enter the above-mentioned information on your behalf, if needed. To use this option please send an email to compendium@ifeh.org (maintained by Henning Hansen)

Thank you for assistance in keeping the Compendium an up-to-date resource for today's sustainable development practitioners.

Background information.

A new phase in the Federation's work on indicators, which started in 2000, has been launched - and it has been named the Sustainability Indicator Initiative (SII).

The backbone of this new initiative will be based on the collaboration between the International Institute of Sustainable Development - IISD and the International Federation on Environmental Health - IFEH.

The IISD has since 1995 been hosting the Compendium on sustainability indicator initiatives. This is a web database of indicators initiatives, worldwide.

The Compendium will serve as the common database to hold information on indicator initiatives - including the inputs coming as a result of the IFEH sustainability Indicator Initiative.

In 2005 an agreement (MoU) was approved by both IFEH and the IISD:

MEMORANDUM OF UNDERSTANDING BETWEEN INTERNATIONAL FEDERATION OF ENVIRONMENTAL HEALTH AND INTERNATIONAL INSTITUTE FOR SUSTAINABLE DEVELOPMENT ON COLLABORATION TO ADVANCE THE USE OF SUSTAINABILITY INDICATORS.

The whole MoU can be seen below in annex 1.

An important offset for this agreement was the IFEH Policy no 8 - Declaration on the use of Sustainability Indicators as well as the IFEH Sustainability Indicator Project. The Policy no 8 can be found in annex 2.

An IFEH working group has been formed to ensure progress regarding the initiative.

The IFEH SII Working group comprises:

Henning Hansen, Coordinator of the initiative, ENVINA Denmark
Fred O' Brien, Vice President IFEH, CIPHI Canada
Steen Fogde, ENVINA Denmark
Domenic Losito, CIPHI, Canada
Raymond Ellard, Honorary Secretary IFEH, EHOA Ireland

Annex 1

MEMORANDUM OF UNDERSTANDING BETWEEN INTERNATIONAL FEDERATION OF ENVIRONMENTAL HEALTH AND INTERNATIONAL INSTITUTE FOR SUSTAINABLE DEVELOPMENT ON COLLABORATION TO ADVANCE THE USE OF SUSTAINABILITY INDICATORS

WHEREAS recent analyses have identified monitoring information systems as a systemic weakness in strategic and coordinated action for Sustainable Development (along with coordination among levels of government); and

WHEREAS there is much duplication of efforts in indicators, which itself is not sustainable; and

WHEREAS it is acknowledged that the IFEH declaration on the Use of Sustainability Indicators will not in-and-of-itself bring about change, but will require active follow-up;

THEREFORE
The undersigned representatives of the IFEH and the IISD hereby agree to the following:

1.
Upon adoption by IFEH of its Declaration on Sustainability Indicators, a shorter and more robust policy statement will be drafted jointly, focusing on strategic issues in indicator initiatives at the community and regional level. The purpose of the statement will be to call attention to the risks and opportunities arising from the large and growing pool of sub-national level indicator initiatives and to facilitate the crystallization of a policy agenda related to them on the national and international levels. The statement may cover topics such as the need for increased efforts aimed at better coordination of sustainability indicator efforts, or the need for capacity development.

2.
IFEH and IISD will work together to engage other major organizations with interest in taking the indicator agenda to the next level.

3.
IFEH and IISD will collaborate on the Compendium of Sustainable Development Indicator Initiatives. Based on feedback received from IFEH, IISD will first adjust the Compendium structure if necessary. Merger of IFEH's data will follow this into the IISD Compendium. The IFEH website would link to a sub-window showing the modified compendium housed on IISD's server and IFEH will invite its global members to submit relevant information.

4.
The two organizations will jointly explore funding opportunities for further developing the Compendium.

5.
The parties understand that the proposed collaboration may require the sharing of intellectual property and express their dedication to keep products and information jointly developed available at no cost to the general public. The parties also agree that their contribution to the products developed in collaboration will be explicitly recognized.

Agreed on behalf of IFEH and the Measurement and Assessment Program of IISD:
October 8, 2005

Mr. Henning Hansen
Coordinator of the IFEH indicator initiative
On behalf of the International Federation of Environmental Health

Dr. László Pintér
Director
Measurement and Assessment Program

Annex 2

Declaration on the use of sustainability indicators

WHEREAS

- the environment is endowed with its own integrity and dynamic balance; and
- each and every person and the communities of peoples bear a responsibility for the care of the environment; and
- the International Federation of Environmental Health (IFEH) is committed to caring for the environment in the interest of world health; and
- IFEH in pursuing this commitment recognises the need for sustainability[1] indicators to provide benchmarks for progress in this area; and
- IFEH recognising the dignity of the human person and in keeping with the principles of social justice, supports the Aarhus Convention[2] and, in particular, the principle of the right of citizens to "*access to information on the environment*"; and
- IFEH strongly endorses the use of sustainability indicators to measure and assess progress toward sustainability; and
- IFEH understands that sustainability indicators are multidimensional as well as sectoral measures by which it becomes possible to show the development and links among a community's economy, environment, health, cultural and social conditions; and
- IFEH understands sustainability indicators to be indicators or frameworks of indicators that follow the Bellagio[3] principles; and
- to be effective, sustainability indicators should be easy to understand, relevant, reliable and based on accessible data; and
- IFEH acknowledges that citizens and communities should be able to access information which is presented on the basis of sustainability indicators; and
- IFEH holds that Citizens and communities should be able to participate in the selection of sustainability indicators so that they are meaningful to them; and
- IFEH recognises that providing citizens and communities with access to information is a mark of good governance and a prerequisite for sustainable development; and

- IFEH believes that only by using indicators will it be possible to decide objectively whether changes over time represent a move towards or away from sustainability; and that it is only by having this knowledge that it will be possible to respond in the most effective way; and
- IFEH believes that it is only by relying on robust indicator values that specific targets can be set and effective solutions implemented; and
- IFEH initiated a project on Sustainability Indicators based on international sharing, co-operation and participation which is now entering a new phase in co-operation with other international partners; and now

Therefore, the IFEH

- Calls upon local, regional and national authorities responsible for environment and health, in conjunction with their citizens, to set up effective monitoring systems, using sustainability indicators; and
- Calls upon its members to actively encourage local, regional and national, authorities to establish such monitoring systems, to make them easily accessible to citizens and to share them through mechanisms such as the IFEH's project on sustainability indicators
- Encourages, in the establishment and implementation of such monitoring systems, the application of the social principles of solidarity[4] and subsidiarity[5]; and the enculturation[6] of the monitoring programmes to satisfy local circumstances

Jerry Chaka, **President**
21st of June 2005

[1] **Sustainability**: development today must not undermine the development and environment needs of present and future generations.

[2] United National Economic Commission for Europe Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters – done at Aarhus Denmark 25th June 1998

[3] In 1996, in cooperation with a group of leading international practitioners, the International Institute for Sustainable Development (IISD) developed general guidelines for the practical assessment toward sustainable development, commonly known as the Bellagio Principles.

[4] **Solidarity**: the mindset that recognises the interdependence of all human beings

[5] **Subsidiarity**: decisions are taken as close as possible to the level at which they can be effectively implemented

[6] **Enculturation**: framing as to be sensitive and relevant to the culture

Spotlight on the Malta Association of Public Health Inspectors

Malta has long had a reputation for excellence in Public Health, with measures to prevent the introduction of infection being recorded in the early 1500's, when ships were isolated in Marsaxett Harbour. An organized enforcement body, the 'Magistri Sanitatis,' was set up in 1538, during the time of the Order of St John. Strict enforcement of the law was practiced and emphasis was made on the construction of intricate sewage and drinking water systems, some of which are still operational to this very day. In January 1799, the French shot an inspector Mattew Pulis, as his 'right of entry' enabled him to act as a go-between between the Maltese insurgents both inside and outside the walls of Valletta.

Following a Royal Commission in 1838, the Water Police and the Quarantine Departments were amalgamated under the Superintendent of Quarantine. A review of measures to prevent disease gave rise to a comprehensive set of regulations, which were later consolidated in a special ordinance embodied in Maltese law. The next major changes took place in 1885 and 1895, with the formation of the Public Health Department. Someone who left his mark during this time was Sir Temi Zammit, a Medical Officer of Health who was instrumental in the initiation of chlorination of water supplies, six months after its benefits were discovered in the United Kingdom. In 1887, together with Sir Robert Bruce, a British army doctor, Dr. Zammit isolated the Brucella Melitensis organism from the spleen of a dead British soldier.

The first association for Health Inspectors, or rather Sanitary Inspectors as they were known prior to 1957, was set up in 1935 under the name Sanitary Inspectors Association. The aim of the Association was then to disseminate knowledge on public health matters and it also carried out the duties of a union in order to safeguard the rights of its members. It was affiliated with the Association of Health Inspectors of the United Kingdom. It was also responsible for the establishment of the local representation of the Royal Society of Health in Malta. Unfortunately, the Society became increasingly fragmented during the early nineteen seventies and gradually disappeared.

A new society, the Malta Association of Health Inspectors was reactivated in 2003. The name was eventually changed to The Malta Association of Environmental Health Officers following a change in the official nomenclature of the Inspectorate.

Its mission statement: **The Association is committed to render the highest level of public service in the field of food safety and environmental health, to establish an identity and voice for the Health Inspectors of Malta and Gozo, and to enhance their professional status.**

Activities of note that were held since then include a seminar held in collaboration with the Food Law Enforcement Practitioners Organisation (FLEP), seminars on Ventilation and Smoking, Legionnaires' disease and HACCP. A working holiday was also organized for its members in Manchester, and members of the committee also attended for meetings held by the IFEH and EFEH. The Food Safety Commission also entrusted the Association with an FP6 project entitled 'Diet and Food Contaminants in the Maltese Islands'. The success of this enabled MAEHO to enter into another successful project, which was the acquiring of the premises from which it could operate. The Minister of Health officially opened the premises situated in Gzira in December 2006. The building consists of an office, boardroom and a lecture room. There is also a commercial outlet within the premises itself operated by MAEHO, which principally sells items related directly to the food industry. MAEHO also issues a quarterly magazine for all its members called 'Tas-Sanita' which is a title the public uses when referring to Environmental Health Officers. It also organizes courses for Food Handlers and carries out sampling of water to test for the presence of Legionella. It is in the process of offering consultations in various matters related to Food Safety namely HACCP and Food Safety Management Systems.

All Health Inspectors are committed to:

- Treat staff and the public they are serving fairly, regardless of race, ethnic or national origin, age, religion, gender, marital status, disability or sexual orientation;
- Conduct themselves with integrity, impartiality, honesty and without bias or misadministration;
- Declare if they have any personal interest in any food business;
- Take all reasonable steps to avoid circumstances, which may imply bias or the appearance of bias;
- Carry out their activities so that these cause the minimum disruption to the establishment, organisation or general public;
- Respect the confidentiality of information obtained subject to any statutory disclosure requirements;
- Look for ways to continually improve and develop the way in which they undertake their activities;
- Be clear about their judgements and be able to demonstrate a clear audit trail of how they reach their decisions and evidence on which they are based;
- Report their findings without fear and favour;
- Seek out and spread examples of good practice.

The present Executive Committee comprises:
Aaron Simpson, President
Hadrian Bonello, Honorary Secretary
Antoinette Vella, Vice-President
Rachel Mercieca, Treasurer
Paul J. Micallef, Asst. Secretary
Louise Mangion, Asst. Treasurer
Mark Cutajar, Seminars

Paul J. Micallef, Rachel Mercieca, Hadrian Bonello (Hon. Secretary), Louise Mangion, Antoinette Vella, Aaron Simpson (President)

Chinese New Year Parade - San Francisco

By Diane Evans, Past President, IFEH

Named one of the world's top ten parades, the San Francisco New Year Parade is one of the few remaining night illuminated parades in the country. Started in the 1800's to educate the community about Chinese culture, the Parade and Festival have grown to be the largest celebration of Asian culture outside of Asia. Nowhere in the world will one see a lunar new year parade with more gorgeous floats, elaborate costumes, ferocious lions, exploding firecrackers, etc, ... and leading the parade this year as the "Grand Marshall" was San Francisco's Health Department's Principal Inspector, Lisa O'Malley, R.E.H.S.

This honour was bestowed on her and her staff's dedication, sensitivity, tenacity, and hard work in the Chinatown community - especially with food establishments. As related to me by Lisa, when the Chinese Chamber of Commerce called her and asked if she would be willing to be the "Grand Marshal" of the parade, she thought that they were joking. It was only when they called back to ask for a picture and her resumé that she awoke to the fact that the invitation was "for real".

Unfortunately, her request that her staff be allowed to sit in the car with her was politely refused. The lead car is for her and her immediate family. I was informed that her sons will be accompanying her in the car and that her husband will be joining her on the grand stand at the end of the parade.

It has been said-far to often- that our profession and our work go unrecognized and unappreciated. Here is a case in which a community is recognizing "us" and appreciating "our" efforts. Lisa recognizes that by being the "Grand Marshal" she is not only representing her staff, the Department, but in essence all of us.

Hopefully CEHA will afford her an opportunity in the near future to "tell her story" in respect to how she and her staff accomplished this feat.
Lisa O'Malley's email is:
LisaO'Malley@dph.sf.ca.us

New Head of Health Services for Cyprus

Earlier this year George Georgallas was installed as Head of Health Services in Cyprus.

George qualified as an environmental health officer in Cyprus in 1970, and then by post graduate study obtained a Master's Degree in Environmental Health. Having worked at as an EHO at various centers until 1989 he moved to the Health Services District Office in Nicosia. He was Chief Environmental Health Officer at Head Quarters of the Health Services in the Ministry of Health.

George has been extensively involved in the development and enforcement of food safety legislation both at home and within the European community. Most recently he has worked as an expert and consultant with the World Health Organisation.

In 2004 he was elected as President of the Association of Public Health Inspectors Cyprus and has regularly represented that organisation at IFEH Council meetings and Conferences. In 2006 the Royal Environmental Health Institute of Scotland elected him as an Honorary Vice-President of their Institute.

Fruit Canning Industrial Wastewater Management in Swaziland

A. F. Murye, A. O. Fadiran[2], and T. N. Dlamini[3]

ABSTRACT

This paper presents findings of a study carried out at the Swazi Fruit Canning industry between February and April 2006. The industry disposes of its wastewater into the Mhlambanyatsi river. The study aimed at evaluating the management of the wastewater emanating from the facility as a whole in order to verify whether it was fit for disposal into this natural water body. It adopted an experimental design and used a quantitative approach. Water samples were collected fortnightly from the following five strategic points: where the domestic and industrial effluent meet; catchment dam; before entry to river; and downstream from the entry point; making a total of four sampling dates. The parameters analyzed included chemical oxygen demand, biological oxygen demand, electrical conductivity, pH, faecal coliforms, nitrates, phosphates, total dissolved solids, and temperature. The findings revealed that, the levels of these parameters fall within the recommended standards of WHO, USEP, Swaziland Water Services Corporation, and the Swaziland Water Act of 2000. The researchers concluded that, the wastewater management system of the facility was adequate. They recommend that, other environmentally significant variables such as pesticides, phenols and other organics be included in the routine analysis of the factory's wastewater.

INTRODUCTION

Water is a sine qua non for human life. Not just humans, but the ecosystem as a whole uses it practically everywhere and for everything. Animals drink it and plants take it up through their roots for growth and other processes. In most developing countries urban river pollution is directly associated with waste discharges and the degree of pollution differs according to the type and composition of the waste (Engelbretch, 2005). Releasing water containing impurities results inevitably in health problems such as diarrhoea and cholera for people who depend on the water for drinking and/or other domestic uses. Similarly, organisms such as fish in such polluted water bodies are highly prone to being contaminated with the inherent pollutants becoming cumulative over years.

Industries need to use water one way or another in the manufacturing process and if they have to use polluted water to start with they have to treat it first and that becomes expensive for their operations. Fruit Canners grow and process fruits such as pineapples, oranges, lemons, and mangoes. They produce and can slices, pieces, crush and concentrates. They also processes locally grown fruits to produce orange segments, orange and grape fruit concentrates (Anonymous, (2006a).

Wastewater

Wastewater is any water that cannot be used prior to undergoing treatment, although Anonymous, (2005b) defines wastewater as any water that has been used in homes, industries, and businesses that is not fit for reuse unless treated. Excluding rainwater, which has not been contaminated by human activities, wastewater therefore, includes liquid wastes being discharged from domestic houses, industrial, agricultural or commercial processes. Another definition given by Anonymous (2005c) is that, it is the used water and solids from a community that flow to a treatment plant inclusive of storm water, surface water and groundwater infiltration. The term 'sewage' usually refers to household wastes, but it is being replaced by the term 'wastewater'.

The variation of fruit canning industrial wastewater quantities vary according to the quantity of influent water; rate of water consumption; type of fruit processed; condition (ripeness, damage) of raw product; whether product is conveyed by a wet or dry processing techniques (such as washing, bleaching, peeling); whether brine, caustics and other chemicals are used in processing; clean up methods (dry versus wet, detergents, disinfectants); frequency and duration of cut downs; condition and type of equipment; and management and staff training (Anonymous, 2005e).

Relatively high levels of a number of pollutants have been detected in water and soil samples taken from the vicinities of fruit-canning industries. This has given rise to environmental and health effects for the surrounding habitat. Untreated wastewater can result in pollution of land; the receiving water and groundwater may also be at risk. This poses a threat to the people who use that water for cooking, washing and other domestic purposes as it exposes them to a wide range of infections. Besides being endangered directly, people are at risk in the sense that animals drink the water and if it is polluted the contaminants accumulate in their bodies and when humans eat them they indirectly cause health risks. The same is true for plants growing in the polluted water. Wastewater also serves as a medium through which pathogens infiltrate into food chains and food

webs. Swaziland Fruit Canners are the only fruit canning industry in the country that releases their wastewater to the Mhlambanyatsi River. The concern for this study was whether this wastewater is "well treated and managed" to avoid environmental pollution and the consequent health impacts.
This study sought to assess the methods and strategies employed by the Swaziland Fruit Canners for the treatment/management of its wastewater and determine whether or not the water is fit for discharge into the natural waterways. It therefore established the type of wastewater produced; determined the characteristics of the wastewater from existing records and verification tests; identified the strengths and weaknesses of the management approaches, and made recommendations.

Since food processing activities typically produce large quantities of solid wastes, wash water and process wastewater containing organic matter and suspended solids, liquid effluent consisting of a variety of contaminants may be generated during different processing stages (Anonymous, 2005f). Anonymous, (2005e) adds that although a general distinction can be drawn between wash water (from washing of raw materials, plant cleanup etc) and process water (from value adding steps such as peeling, sorting, canning etc) such a clear categorization of wastewater may not always be possible. Analysis of contaminant loads in wastewater may be required to determine treatment requirements.

The same website continued to explain that, contaminants of particular concern are the decomposable organic compounds (determined through measurement of five day biochemical oxygen demand) and solid, particularly suspended solids (non-filterable residue). Other parameters such as pH, temperature, salts, dissolved solids, nutrients, plant pathogens, and pesticides and cleaning agents, may be of concern depending upon envisaged concentration and/or circumstances.

Tebbutt, (1998) claims that, contaminants behave in different ways when added to water. Most organics, some in-organics and many microorganisms are degraded by natural self-purification and as such their concentrations reduce with time. The rate of decay of the material is a function of the nature of the particular pollutant, the receiving water quality, temperature, and some other environmental factors. Tebbutt, (1998) further states that, many inorganic substances are not affected by natural processes so they can only be diluted and are often unaffected by treatment so that their presence can limit the use of the water.

Types of pollutants that are of concern in wastewater management include toxic compounds, which result in the inhibition or destruction of biological activity in water. These include pesticides and anything that affects the oxygen balance of the water. Hence they also include substances that consume oxygen (which may be bio-chemically oxidized organic materials or inorganic reducing agents) and/or substances, which hinder oxygen , transfer across the air- water interface. Oils and detergents can form protective films at the interface that reduce the rate of oxygen transfer and may thus amplify the effects of oxygen consuming substances. Thermal pollution can upset the oxygen balance because the saturation of dissolved oxygen (DO) concentration reduces with increasing temperature. Another type would be inert suspended or dissolved solids which in high concentrations can cause problems, e.g. China clay washings can blanket the bed of a stream and prevent the growth of fish from the vicinity and thus act effectively as a poison (Tebbut, 1998).

Fruit canning industries constitute a seasonal operating system. The annual campaign may last a few months but the quantity of wastewater involved can be significant and its impacts on the environment can be equally significant. Wastewater from fruit canning operations is rich in organic compounds as soluble, colloidal and suspended form, as it originates from the processed commodity (Anonymous 2005g). According to Anonymous, (2005g), most of the water used in fruit canning industry is not employed for consumptive use, hence wastewater management and treatment, prior to disposal to natural receivers, is a prerequisite.

Parameters in wastewater treatment

1. Temperature
The temperature of wastewater is commonly higher than that of the local water supply because of the processes that it undergoes whilst in the plant and also because there is an addition of warm water from households and the industrial activities. Although groundwater temperature is usually fairly constant, surface water temperatures are usually within the range of $0^{o}c$ and $30^{o}c$ (UNESCO *et al.,* (1992). However, these may fluctuate seasonally with minima occurring during winter or wet periods and maxima in summer or dry seasons, particularly in shallow waters. Metcalf and Eddy (2003) affirm that, water temperature is a very important parameter because of its effect on chemical reactions and reaction rates, aquatic life and the suitability of water for beneficial uses. UNESCO, *et al.,* (1992) also claims that, temperature affects physical, chemical and biological processes in water bodies and, therefore, the concentrations of many variables.

Increased temperature can cause a change in the species diversity of fish that exist in the receiving water body.

Temperature is basically important because of its effect on other properties such as speeding up chemical reactions, reduction in solubility of gases (UNESCO *et al., (1992)* and amplification of tastes and odours. (Miller 2005, Chiras 1988, Moran *et al.,* 1983 stress that some species may be eliminated entirely if water temperature rises by 10ºc. Miller (2004) emphasizes the impact of excessive temperature on aquatic organisms as they make them more vulnerable to disease, parasites, and toxic chemicals. When fruit canning industries open for operations and close down for repairs or during off-season, the wastewater influent is disrupted and normally, organisms get adapted to particular temperature range. This causes abrupt fluctuations in temperature that can kill fish and other organisms (Miller 2004) by thermal shock. As temperature has an influence on so many other aquatic variables and processes, UNESCO *et al.,* (1992) recommend that, it is important to always include it in a sampling regime, and to take and record it at the time of collecting water samples.

2. pH

According to Pierce *et al* (1998), pH is a measure of hydrogen ion concentration, which in turn is a measure of its acidity. Aquatic organisms are sensitive to pH changes, and biological treatment requires either pH control or monitoring. It is very important if proper chemical treatment is to be ensured and is sensitive for all phases of wastewater treatment. According to UNESCO *et al.,* (1992) pH influences many biological and chemical processes within a water body and all processes associated with water supply and treatment. Metcalf and Eddy (2003), claim that the concentration range suitable for the existence of most biological life is quite narrow and critical typically between 6 and 9 and extreme hydrogen ion concentrations are difficult to treat biologically and if not altered before discharge, wastewater effluent may alter its concentration in the natural waters.

3. Solids

These are any tangible pieces of matter that are most often likely to be found in suspension in the wastewater content. Metcalf and Eddy (2003) support this as they maintain that wastewater of any kind contains a number of different kinds of solid materials. Tebbutt (1998) classifies solids into two broad groups namely: (i) those present in suspension and/or in solution and may be divided into organic and inorganic matter and (ii) those that arise due to soluble matter and called total dissolved solids (TDS); and suspended solids (ss) which are discrete particles that can be measured by filtering a sample through a fine paper. The latter consist of silt, clay, fine particles of organic and inorganic, soluble organic compounds, plankton and other microscopic organisms (UNESCO *et al.,* 1992). These particles vary in size from approximately 10nm to 0.1mm in diameter (UNESCO *et al.,* 1992). Settleable solids are those removed in a standard settling procedure using a 1litre cylinder. They are determined from the difference, between SS in the supernatant and the original SS in the sample (UNESCO *et al.,* 1992).

4. Pesticides and agricultural compounds

According to (UNESCO *et al.,* 1992) pesticides are chemical compounds toxic to certain living organisms, from bacteria and fungi up to higher plants and even mammals. Insecticides, herbicides, fungicides, nematocides and some agricultural chemicals are toxic to many organisms and can be significant contaminants of surface waters. These chemicals in high concentrations can cause fish kills in the eventual release of the wastewater, (Metcalf and Eddy 2003). Though there is no application of pesticides or herbicides at the fruit processing plant these may be brought in with the fruits from the plantations. Residues may be found on the skin and dissolved in water when the fruits are washed.

5. Nutrients

Nutrients in wastewater result in algal growths that in turn block sunlight penetration through the water and form a layer on top of the water surface. The main culprits according to Metcalf and Eddy (2003) are nitrogen and phosphorus which elements are essential to the growth of micro organism, plants and animals and are known as bio-stimulants. Trace quantities of other elements such as iron, are also needed for biological growth but nitrogen and phosphorus are by far, the major nutrients of importance. Where control of algal growths in the receiving water is necessary removal or reduction of nitrogen and phosphorus in the wastewater prior to discharge may be desirable. (UNESCO *et al.,* 1992) recommend that both nitrogen and phosphorus species be reported in milligram per litre or mgl^{-1} as nitrogen or phosphorus ($NO_{3-}N$ and $PO_{4-}P$ respectively). The enriching of the water bodies with these chemical species leads to cultural eutrophication (Chiras, 1988; Clapham, 1983; and Manahan, 2000) due to algal and other aquatic plants bloom that die, decay, depletes water of dissolved oxygen, and kills fish (Miller, 2004). Also drinking water with high levels of nitrates lowers the oxygen-carrying capacity of the blood and can result in the death of unborn children and infants through the development of the “blue-baby syndrome” (Miller, 2004).

6. Salts
Salinity is the various inorganic minerals and salts dissolved in a given volume of water Miller (2004). This may pose a problem if the wastewater is to be used for irrigation purposes. According to Smith (2000), when plants extract the water they need, the salts present in all natural waters become concentrated resulting in an elevated concentration of salts in the soil and water running off the land. Smith (2000) further states that every river increases its salinity as it flows to the ocean. Cleaning agents such as detergents, bleaches etc and plant pathogens are also present in the wastewater constituents of an establishment or manufacturing industry.

Part of hygiene requirements is that processors should use large volumes of water for cleaning equipment, plant and products and for washing down and processing operations. This large hydraulic load must be considered in the design and implementation of a wastewater management strategy (Anonymous, 2005e).

7. Chemical oxygen demand (COD)
It is widely used as a measure of the susceptibility to oxidation of the organic and inorganic materials present in water bodies and in effluents from sewage and industrial plants. According to UNESCO *et al.,* (1992), the chemical oxygen demand is a measure of the oxygen equivalent in a water sample that is susceptible to oxidation by a strong chemical oxidant, such as dichromate. The test for COD is non-specific, in that it does not identify the oxidizable material or differentiate between the organic and inorganic material present. Similarly, it does not indicate the total organic carbon present since some organic carbon compounds are not oxidized by the dichromate method whereas some inorganic compounds are oxidized. Nevertheless, COD is a useful, rapidly measured, variable for many industrial wastes and has been in use for several decades. According to UNESCO *et al.,* (1992) the concentrations observed in surface waters range from 20mg/l O_2 or less in unpolluted water to greater than 200mg/l O_2 in water receiving effluents. Generally, industrial wastewaters may have COD levels from 100 to 60000mg/l O_2 (UNESCO *et al.,* 1992).

8. Biological oxygen demand (BOD)
BOD is an approximate measure of the amount of bio-chemically degradable organic matter present in a water sample. It is defined by the amount of oxygen required for the aerobic microorganisms present in the sample to oxidize the organic matter to a stable organic form. The method is subject to various factors such as the oxygen demand resulting from the respiration of algae in the sample and the possible oxidation of ammonia (if nitrifying bacteria are also present). The presence of toxic substances in a sample may affect microbial activity leading to a reduction in the measured BOD. Standardized laboratory procedures are used to determine BOD by measuring the amount of oxygen consumed after incubating the sample in the dark at a specified temperature. The oxygen consumption is determined from the difference between the dissolved oxygen concentrations in the sample before and after incubation period. If the concentration of organic material in samples is very high, samples may require dilution with distilled water prior to incubation so that the oxygen is not totally depleted (UNESCO *et al.,* 1992).

9. Electrical conductivity
According to UNESCO *et al.,* (1992), conductivity or specific conductance, is a measure of the ability of water to conduct an electric current. It is sensitive to variations in dissolved solids, mostly mineral salts. The degrees to which these dissociate into ions, the amount of electrical charge on each ion, ion mobility and temperature of the solution all have an influence on conductivity. In addition to being a rough indicator of mineral content when other methods cannot easily be used, conductivity can be measured to establish a pollution zone e.g. around an effluent discharge, or the extent of influence of run-off waters. It is usually measured *in situ* with a conductivity meter, and may be continuously measured and recorded in ÌScm^{-1}.

10. Faecal coliform
Coliform bacteria occur in high numbers in human faeces, and can be detected as low as one bacterium per 100ml. therefore they are a sensitive indicator of faecal pollution (UNESCO *et al.,* 1992). Faecal coliform bacteria are used to indicate the likely presence of disease-causing bacteria in water (Miller, 2004).

Threats posed by wastewater

1. Environmental Impacts
Releasing wastewater into natural waterways results in negative impacts on the environment and a polluted environment is not conducive for public health. According to Anonymous (2005h), the environmental effects of discharges to natural waterways will relate to the scale and type of operation, the wastewater management practices in place, and to the sensitivity of the receiving environment. Key pollutants in water and wastewater that can cause negative environmental impacts are high levels of biochemical oxygen demand and/or non-filterable residue as itemized under parameters above.

Anonymous (2005e) cites that high demands of oxygen during microbial decomposition of organic wastes can result in serious oxygen deficits in waterways and, where there is serious pollution, the receiving environment may be degraded to the extent that it cannot support aquatic life. It goes further to say that microbial decomposition in the absence of oxygen can also produce noxious gases such as methane, carbon dioxide and hydrogen sulphide. Metcalf and Eddy (2003) assert that extreme offensive odours can lead to deterioration of personal and community pride, interfere with human relations, discourage capital investment, lower socioeconomic status and deter growth. Further more, offensive odours can cause poor appetite for food, lowered water consumption, impaired respiration, nausea and vomiting and mental perturbation.

As more anaerobic conditions develop the colour of wastewater changes sequentially from grey to dark grey and ultimately black, a final colour which endorses the wastewater as septic (Metcalf and Eddy, 2003). Many consumers object to a highly coloured water (Tebbutt, 1998). It is necessary though, to differentiate between true colour due to material in solution and apparent colour due to suspended matter. Solids in the waste stream can also cause undesirable impacts whether in suspension or as settleable solids. High levels of turbidity caused by suspended solids decrease the clarity of the water, physically hindering the functioning of aquatic plants and animals and providing a protective environment for pathogens. Solids that settle on the streambed can form anaerobic sludge that smother bottom dwellers and produce a hostile low oxygen environment (Anonymous 2005e).

Similarly, Anonymous (2005e) claims that elevated loadings of nutrients such as nitrogen and phosphorus in effluent can lead to excessive algal growth producing long-term problems with odour and toxic algal species.

An increase in nutrient level and biological production results in nutrient rich or eutrophic water (Tebbutt, 1998). The water may become heavily polluted by vegetation, low Dissolved Oxygen (DO) levels will occur during darkness, and anaerobic conditions may well exist. According to Miller (2004) during hot weather and drought nutrient overload produces dense growths of organisms such as algae, cynobacteria, water hyacinth and duckweed. And when algae die, decomposition by aerobic bacteria depletes dissolved oxygen in the surface layer of water near the shore and in the bottom layer. This oxygen depletion can result in the death of fish and other aerobic aquatic animals. If excess nutrients continue to flow, anaerobic bacteria take over and produce gaseous decomposition products such as smelly, highly toxic hydrogen sulphide and flammable methane.

Disinfectants such as chlorine may also be present in wastewater where it is used during cleaning activities or wastewater treatment and may be harmful to aquatic life. Residual pesticides and fungicides also impact negatively on the receiving environment (Anonymous, 2005e).

2. Threats to other industries

For industries to use polluted water in the manufacturing processes, they have to treat it first which becomes expensive for their operations. This water can also endanger the health of workers of a neighbouring downstream industry.

3. Wastewater Treatment Methods

According to Metcalf and Eddy (2003), methods of treatment in which the application of physical forces predominate are known as unit operations and those in which the removal of contaminants is brought about by chemical or biological reactions are known as unit processes. At present, unit operations and unit processes are grouped together to provide various levels of treatment known as preliminary, primary, advanced primary, secondary (with or without nutrient removal), and advanced (or tertiary) treatment. Metcalf and Eddy (2003), provide the stages of wastewater treatment.

Sustainable Wastewater Management

1. Waste Management Hierarchy

The sustainable way to manage wastewater in an environmentally friendly manner (as adapted from Miller, 2004 and Chiras, 1988) is to avoid waste production, recycle or reclaim water from wastewater, reuse, treat waste to reduce potentially degrading impacts, and dispose of the waste in a safe manner having regard to the best practice of environmental management.

2. Qualities of good wastewater management

The disposal of wastewaters became a necessity as soon as humans began to live in organized communities. Furthermore, with an increase in the use of surface waters as sources of potable water supply; there is now a greater emphasis on the control of river water quality and on the reduction of its pollution generally (Bartlett 1971). The original aim of sewage disposal was the removal of waterborne waste from domestic and industrial communities without causing any danger to health and cites. The core principles of a good wastewater management system are to remove as much of the solid contents as is practicable and economical, and then oxidize and subsequently remove the colloidal and dissolved solids (Bartlett, 1971). The effluent when discharged should not pollute streams, be a danger to public health, or cause a local nuisance. The method of treatment chosen for any particular installation will depend on the quality and quantity of effluent required and on the area and type of land available. The method should be economical and not cause nuisance to adjacent properties by noise, smells or insects. Therefore, good wastewater management qualities include eradication of water spread diseases, enabling good health for the public leading to increased economic growth, minimizing land pollution, and recovering this water for use (Metcalf and Eddy, 2003).

METHODOLOGY

The research adopted an analytical design. This was done by comparing three groups of data on a predefined number of variables the researchers were interested in, and determined if the groups really differed with respect to these variables. The study type was case-control whereby the investigators compared two sets of data sources from samples taken from the wastewater system within Swazican and the recipient Mhlambanyatsi River and the other data set was Swazican Records, which were checked against National Standards as controls.

The study was conducted at the Swaziland Fruit Canners, the population size was the whole of the Estate, and different points were used for sampling within the facility (Table 1). The variables measured were pH, temperature, COD, BOD, total dissolved solids, nutrients (nitrates and phosphates), electrical conductivity, and faecal coliforms. The services foreman was interviewed using a questionnaire. Secondary data were gathered from laboratory analysis and records. Reliability was ensured through taking samples in a total of four days fort-nightly with the aim of comparing the results against the company records. The questionnaire was pre-tested at Swaziland Paper Mills to ensure external validity and reliability. A stratified sampling was employed. One litre plastic bottles were used for sampling. The results were compared with the Standards regulated by government through the Swaziland Water Act 2000 and the Swaziland Water Services Corporation standards.

Table 1. Sampling points

Sampling Point	Description of the point
A	Domestic and industrial effluent meet
B	Catchment Dam
C	Before entry to river
D	Entry point to the river
E	Downstream to entry point

To ensure sample quality before reaching the laboratory, the bottles were sealed and stored in a cooler box lined with icepacks to ensure that the temperature of the samples does not rise above 4ºC during transportation from the site to the laboratory for analysis on the same day (Natural Resources and Energy, 2000). Microsoft Excel was used for data analysis. Permission was sought from the Human Resource Department where the researchers were referred to the Environment section with whom the researchers continued to liaise until completion of study.

RESULTS AND DISCUSSION

The effluents originating from the cannery pass individual solid traps before being discharged via pipeline to the final solids separation screen, where the remaining solids above 0.5/0.6 mm in size are removed. The effluent is then discharged to a series of four settling dams. Sewage from the factory is added between the outflow from the solids separation screens and the inflow to the settling dams.

From the last settling dam the effluents overflow into a pipeline to be discharged into three anaerobic dams. The sewage originating from the living quarters is added between the overflow from the settling dams and the inlet into the anaerobic dams. Subsequent to the anaerobic dam the effluent passes three aerobic dams of volumes (Anaerobic dam, 12 000m^3; Aerobic dam 1, 3 700m^3; Aerobic dam 2, 2 500m^3; Aerobic dam 3, 2 800m^3.

In an interview with the Services Foreman at Cannery, it was gathered that the Company has a set of regulations in the form of standards adapted from the World Health Organization. The Company tries to adhere to these standards to the best of its ability though the standards are stringent. It was also gathered that previously there had been no one whose sole responsibility was wastewater until about three years ago from the time of the study. Wastewater management at company is by the people, so hands on experience is encouraged and every employee knows how to take samples and carry out analysis in the absence of the foreman. Also there are daily shift logging systems that are used to ensure that every worker in the wastewater department gets an opportunity to actually sample and carry out an analysis of the wastewater.

There have been notable improvements in the form of, 52 bags of urea were bought and used on a weekly basis to make effluent quality better because the reed beds used to get burnt by the effluent but now only 30 bags are used and reed beds are evergreen. Previously 50 000 tones of lime was used to control pH however, currently, the Company buys about 22 000 bags per year for pH control. Plants along the drainage used to take up much of the lime such that it had to be re-added on the anaerobic dam. Presently, plants are removed from the pipe work and the anaerobic dam is periodically excavated to remove growing vegetation on top thus allow the processes to take place as they should.

At site A COD levels (Table 2) were at a high 1135mg/L supposedly because the effluent was still raw and still being untreated. The value went even higher at site B reaching its peak at 1879mg/L. This might have been brought about by all the chemical reactions taking place within the wastewater hence the corresponding need for elevated oxygen amounts by the processes occurring within the wastewater. At site C a low 20.5mg/L was recorded rising to 181mg/L at the entry point of the wastewater. This means that, there was still a lot of microbial degradation taking place within the wastewater itself, but the levels took a sharp dive downwards to as low as 5mg/L at point E. The standard for COD is 75mg/L (Swaziland Water Services Corporation). The trend for this parameter reflects good wastewater management by the Company. This was a lower value compared to the 1879mg/L recorded at the catchment dam (Site B).

Table 2. Mean levels of the analyzed wastewater parameters from the fruit canning industry

Parameter Sampling Site	COD (mg/L)	BOD (mg/L)	EC (μS/cm)	pH	Fecal Coliforms (per 100m)	NO_3-N (mg/L)	PO_4^{3-} P (mg/L)	TDS (mg/L)	Temp. (°C)
A	1135.00	451.00	74.50	5.75	57500.00	39.80	21.50	84.25	23.30
B	1879.00	898.00	113.30	5.83	3750.00	16.50	3.75	122.50	22.30
C	20.60	16.50	17.10	5.80	0.00	4.80	5.13	16.75	21.70
D	181.00	36.00	53.90	5.62	395.00	10.10	2.75	59.00	22.40
E	5.00	1.50	17.00	5.57	10.00	1.80	1.75	17.00	21.90

At site A, the average BOD value was 451mg/L - a higher amount than the standard indicating that the micro-organisms need for oxygen whilst breaking down the organic matter in the wastewater was high, may be due to the fact that the organic matter itself was present at high amounts at this site. It went higher (1879mg/L) at point B probably because of organic matter's presence in the treatment process as it was not isolated from the environment. At point C it was 16.5mg/L and rose to 36mg/L where the wastewater entered the river and was reduced to 1.5mg/l further down the stream. This is also within acceptable range as the standard for BOD stands at 10mg/l (Table 3).

At site A, an average of 74.50μS/cm was recorded for electrical conductivity. This value was lower than the standard (250μS/cm). It rose at B, to 113.30μS/cm. This was probably due to the water dissolving even more of the salts and retaining the dissolved solids causing a shoot up in the conductance value. Site C recorded the lowest conductance value because there were little amounts of solids and it went up once again at point D where it recorded 53.9μS/cm. Probably this was due to the water cooling and reaching a density close to that of the river water which made the water to mix. Further down at site E the values went down to a 16.945μS/cm a value within the set standard.

At the sampling point A the pH value is 5.75 indicating acidity. The wastewater was still raw meaning no treatment has been carried out on it. Another factor contributing to this low pH may have been temperature. In site B there was a rise in the pH though it was still acidic at 5.83 but at that point (B) the treatment was almost complete as the wastewater was at the catchment dam ready for release into the river. In site C the pH was still acidic at 5.80. Downstream, point D recorded 5.62 still an acidic pH value and even lower. That was the point where the influent from Swaziland Fruit Canners made contact with the river. Further downstream at sampling point E the average pH recorded was 5.57 still an acidic value. The stipulated standard pH range is 5.50 – 9.50.

Coliform bacteria occur in high numbers in human faeces, (Chapman 1992). For this reason they are an indicator for fecal pollution. Site A had the highest number of fecal coliforms (57 500 counts per100ml) and could be attributed to the fact that this was where the raw industrial and domestic effluent meets. In the industry itself there were toilets and also at the staff homes. So the degree of fecal material produced was high also because there were workers who used the toilets during working hours who didn't live in the establishment and also after working hours people living in the establishment would have had the need to use the toilets. Some of these got into the wastewater and eventually into the river through surface run off as well as underground leachings.

At the point B, the value recorded was reduced but still considerably high at 3750 counts per 100ml. Point C recorded no faecal coliforms probably because the water is from the dam and there was no human/animal contact in the dam that could have resulted in introduction of faecal material into the dam. At the entry point, D, there was still a considerably large number of coliforms at 395 counts per100ml. Further downstream at point E 10 counts per 100ml were detected. The Swaziland Water Services Corporation standard for this parameter of 10 counts per100ml was not exceeded but the value recorded is not impressive. The water end up flowing at the facility and downstream, and people may be using this water for drinking and if they consume it untreated, this could pose a health risk since WHO recommends a zero count per 100ml of coliforms in drinking water (Table 3). Though many faecal coliforms do not cause disease, some coexist with pathogenic organisms and readily establish themselves at the lower gut of vertebrates, especially humans and produce waste toxins to the host organism. These may lead to stomach aches, chills, diarrhea and severe fever (Anonymous, 2006).

The maximum acceptable concentrations (MAC) for the measured parameters are given in table 3. At site A the level of nitrates was 39.80mg/L, which is higher than the MAC of 10.0mg/L. The NO_3-N (mg/L) dropped to 16.50mg/L at site B, probably because some of it must have been taken up by the vegetation around the treatment system. There were a lot of plant growths around the treatment band with men cutting and clearing the area during sampling. At site C levels were 4.80mg/L and at site D they were at 10.10mg/l. At the final point E, the average value was 7.75mg/L a low value fitting within the standard (Table 3).

At point A an average PO_4^{3-}-P level of 21.50mg/L was recorded and 3.75mg/L was recorded at site B. At site C the level was low at 5.15mg/L and at the point D it was at 2.75mg/L decreasing to 1.75mg/L further down the stream. This could have also happened due to some of it having been absorbed by the plants growing in the area.

At point A the value for total dissolved solids was 84.25mg/L rising to 122.50mg/L at point B showing that even more materials had been dissolved in the wastewater. At point C the average was 16.75mg/L and a value of 59.00mg/L at the point D decreasing to 17.00mg/L downstream at point E.

Table 3. Values of the parameters at each sampling point relative to international organizations standards (Recommended Maximum Acceptable Concentration (MAC))

Parameter	COD (mg/L)	BOD (mg/L)	EC (μS/cm)	pH	Fecal Coliforms (per 100m)	NO_3-N (mg/L)	PO_4^{3-}-P (mg/L)	TDS (mg/L)	Temp. (ºC)
Points with ≥ maximum acceptable concentration (MAC)	A & B	A, B, C & D	–	–	A, B, D & E	A, B & D	A & C	–	–
Points with ≤ MAC	C, D & E	E	–	A, B, C, D & E	C	C & E	B, D & E	A, B, C, D & E	A, B, C D & E
MAC	WHO 250mg/L for drinking water	3.0 – 6.0 mg/L (O_2) for fisheries and aquatic ecosystems (EU) and 3.0 (drinking water - Russia)	WHO 250000 μS/cm for effluent or 1800 for drinking	5.5-9 .5 for effluent (WHO) and for drinking water 6.5 to 8.5	0/100ml (USEPA, WHO, (drinking water) and not more than 200 colonies per 100 ml (swimming water)	10mg/L (WHO)	5.0 mg/L for drinking water (EU) and 1.0mg/L effluent discharge to lakes or streams (EU)	(WHO less 500mg/L (USEPA)	25ºC (EU) or 35ºC (WHO)

MAC values adapted from Zuane, (1990); Metcalf and Eddy, (2003); Miller, (2004); UNESCO *et al*., 1996); Viessman, (2005); and Engelbrecht *et al.,* (2005). USEPA = United States Environmental Protection Agency, EU = European Union and WHO = World Health Organization

At site, A, the value recorded was 23.30ºc this declined to 22.3ºc at point B and was even lower at point C recording an average of 21.70ºc. The value rose slightly at the point D, recording an average of 22.40ºc and it declined again downstream giving an average of 21.90ºc. This parameter was also below the standard range set by WHO for wastewater parameters (Table 3).

Table 4. Points with highest and lowest values of each parameter relative to the MAC

Parameter	COD (mg/L)	BOD (mg/L)	EC (μS/cm)	pH	Fecal coliforms (count/100ml)	NO_3^{-N} (mg/L)	PO_4^{-P} (mg/L)	TDS (mg/L)	TEMP.(ºc)
Points with highest level	B	B	B	B	A	A	A	B	A
Point with lowest values	E	E	E	E	C	C	E	E	C

CONCLUSION

With the exception of fecal coliforms, nitrates, and phosphates whose levels were above the recommended MAC (Tables 2 and 3), all the parameters analyzed fell below the Wastewater Standards. The overview of the results indicate that the river has retained its recovery capacity despite the entry of the wastewater as the levels of most of the parameters analyzed were within the recommended range of freshwater standards. The reason behind the recovery may be because the facility worked only during fruit seasons. It retains its wastewater and treats it before releasing into the waterway. Furthermore, they do not release water all year round except during the rainy season.

RECOMMENDATIONS

Add to the list of routinely checked parameters nitrates, phosphates and temperature.

Adopt researcher’s sampling site within the receiving water body and routinely carry out analysis on those parameters to ensure that, the Company does not pollute the environment and be warned earlier if there are problems with the management system than to have to face bad publicity and litigation measures.

ACKNOWLEDGEMENT

The researchers would wish to thank the staff of the environment department of the Swazi Fruit canners for allowing this study to be carried out. We acknowledge the help given by the UNISWA chemistry laboratory in the analysis of the samples.

REFERENCES

Anon.(2006), http://www.govsz/tools/printbody.asp?pid=2189) 11/03/2006

Anon.(2005f),http://www.adb.org/Documents/Environment/PRC/PRC-FujianII-SIEE.pdf 26.10.05

Anon, (2005c), http://www.alken-murray.com/glossarybug2.htm (26.10.05)

Anon.(2005e),http://www.dpiwe.tas.gov.au/inter.nsf/Attachments/CDAT-5BA9FV/$FILE/Guidelines% 29/10/2005

Anon. (2005a), http://www.en.wikipedia.org/wiki/wastewater 26.10.05

Anon.(2005h), http://www.foodpac.gatech.edu/-annual/99/fp-annual-report.99.p.htm 27.10.05

Anon.(2005g),http://www.gnest.org/cest8/8cest-papers/abstracts-pdf-names/p92Diamantis/pdf 26.10.05

Anon.(2006),http://www.missouriwhitewater.org/preservethesaint/pdf/testparameters.pdf (11.04.06)

Anonymous, (2005d), http://www.ncruralcenter.org/water2030/glossary 26.10.05

Bartlett Ronald E., (1971), Wastewater Treatment. Applied Science Publishers Ltd: London

Chras, D. D., (1988), ENVIRONMENTAL SCIENCE A Framework for Decision Making 2nd edition. Benjamin/Cummings Publishing Company, Inc. Ontario

Clapham, W. B. Jr., (1983), Natural Ccosystems 2nd edition. Macmillan, New York.

Engelbrecht J.C. *et al.,* (2005), Industrial solid and Liquid waste pollution in Limbe River, Malawi. *Environment and Health International 7:2 (2-7),* Edinburgh, Scotland.

Manahan, S. E. (2000), Fundamentals of Environmental Chemistry 2nd edition. Lewis Publishers, London.

Metcalf and Eddy, (2003), Wastewater Engineering 4th ed. McGraw Hill: Boston

Miller G. T. Jr., (2004), Living in the Environment.13th ed. Thomson Brooks/Cole. Australia

Moran, J. M., Morgan, M. D., Wiersma, J. H., (1983), Introduction to Environmental Science. W. H. Freeman and Company, San Francisco.

Pierce J. J. , Vesilind, P. A. and Weiner R. F., (1998), Environmental Pollution.4th ed. Butterworth-Heinemann. Boston

Smith Enger, (2000), Environmental Science.7th ed. McGraw Hill. Boston

Tebbutt T.H.Y., (1998), Water Quality Control.5th ed. Butterworth-Heinemann. Boston

UNESCO, UNEP, and WHO, (1992), Water Quality Assessments. A guide to the use of Biota, Sediments and Water in Environmental Monitoring 1st edition. Taylor and Francis Group, London.

UNESCO, UNEP, and WHO, (1996), Water Quality Assessments. A guide to the use of Biota, Sediments and Water in Environmental Monitoring 2nd edition. Taylor and Francis Group, London

Viessman, W. Jr. and Hammer M. J., (2005), Water Supply and Pollution Control 7th edition. Pearson Prentice Hall, New Jersey.

Problem Based Learning and Community Based Education and Service – as Tools for Training Health Professions at College of Health Sciences, Moi University, Eldoret, Kenya

William Kitagwa
Department of Environmental Health
Faculty of Health Sciences, Moi University, Eldoret, Kenya

ABSTRACT
Most health professional training institutions in the developing world have been modelled on their counter parts in industrialized countries of the northern hemisphere. Their educational programs are not really focussing on the health problems (communicable diseases, malnutrition, sanitation and population growth) of poor, warm climate countries.

In Africa for instance this approach results in a health care situation in which graduate certified health professionals find themselves unaccustomed to assess and evaluate the health needs and priorities of their own countries and the public. They are incapable of providing effective health education or implementing preventive programs. They are ill prepared to work in the slums of the cities or to manage a rural health care team.

In professional health training programs, problem-based learning (PBL) and community-based education and service (COBES) have become an increasingly popular terms that the development of self directed learning skills is encouraged through confronting health professional students with problems that simulate real life in clinical and community situations. The purpose of this paper is to explain PBL and COBES as models of training to achieve health educational relevance to community needs.

Moi University realised such a need and started PBL and COBES programs at the Faculty of Health Sciences in 1988. The mission is to produce graduates with practical and intellectual skills appropriate to the needs of Kenyan society.

The curriculum of the Faculty of Health Sciences integrates PBL and COBES and entails training of doctors, nurses and environmental health officers in the community in which they will later practice. It also addresses the objectives of the Kenyan Ministry of Health, that the provision of health services should meet the basic needs of the population with emphasis on prevention, promotive and rehabilitative services.

KEY WORDS:
Problem based learning, community-based education, community, training tools

INTRODUCTION:

In medical education problem-based learning (PBL) and community – based education and service (COBES) have become increasingly popular terms. The neurologist Howard Barrows, developed problem based learning (PBL) at the Health Science Faculty of McMaster in Hamilton, Canada, in the early seventies. First developed as an instructional method it became soon a circular approach in which learning was stimulated – through small group tutorials using problems that simulated real life clinical situations. The roots of the PBL are the discovery/inquiry learning approaches, process education de-emphasizing the transmission of facts, and instead fostering the acquisition of life long learning and problem solving skills, the hypothetic – deductive model of problem solving and case method used at Havard Business School (De Grave et al, 1994).

After the introduction of PBL in McMaster, several other new medical faculties have used this education approach e.g. Maastricht (Netherlands), Newcastle (Australia), University of New Mexico, Havard Medical School, Faculty of Health Sciences, University of llorin, Nigeria and Faculty of Health Sciences, Moi University, Kenya.

As a teaching method PBL implies the use of problem based learning in tutorial groups, and as an educational strategy, it implies the curriculum as a whole. Most of the innovative medical schools regard PBL as an educational strategy. This view is also taken by the World Health Organisation (Walton and Mathews, 1989).

Established in 1988, the Faculty of Health Sciences at Moi University, Kenya is among the pioneers of PBL and COBES programs in sub-Saharan, Africa. The mission of Moi University is to produce graduates with appropriate practical and intellectual skills (Nangami N.M. 2002) and with a sense of service and a strong inclination towards community care and preventive medicine. The philosophy of the faculty is embodied in the curriculum, which integrates PBL with COBES and entails training doctors, nurses and environmental health officers in the real context i.e. the community in which she/he will later practice. The curriculum of Moi University Faculty of Health Sciences (MU FHS) also addresses the objectives of the Kenyan Ministry of Health: that the provision of health services should meet the basis needs of the population with emphasis on prevention, promotive, and rehabilitative services without ignoring curative services (Government of Kenya, 1994).

The purpose of this paper is to explain PBL and COBES as part of the SPICES utilized by Faculty of Health Sciences, Moi University – Kenya.

PROBLEM BASED LEARNING (PBL) AS AN EDUCATIONAL STRATEGY

The objectives of problem based learning (PBL), states (De Grave et al, 1994).

- To impart relevant, usable (basic sciences) knowledge that is retained and applied in the clinical years.
- To enhance motivation to learn
- To promote self-directed learning skills.
- To stimulate clinical reasoning.

The curriculum of the Faculty of Health Sciences, Moi University is integrated rather than separated into basic sciences, clinical components and COBES. Basic introductory subjects are offered in first and second years; and core subjects (professional)/practice in 3rd, 4th, 5th and 6th years for doctor students, 3rd and 4th year of nursing and environmental health students.

The curriculum is divided into block periods of three to six units. One unit is equivalent to one week. Designing of the block periods takes into consideration the weight and importance of the subject/course content for the relevant profession.

The important characteristics of the block are the use of the SPICES model (COBES digest, 2001): -

S - Student-centered learning
P - Problem-based learning
I - Integrated Curricula
C - Community oriented
E - Early clinical exposure/electives
S - Systematic approach to learning (cases)

Problems are used in several teaching methods like the tutorial groups, patient simulation contacts, case studies, practical activities like visits to clinical areas/community/industries/sites. The tutorial group is a very central teaching method because of the frequency and it determines strongly the self study of students. Tutorial groups are small groups of 8 to 10 students who are learning with problems as a start and end point. These problems are used for developing students to acquire knowledge and skills. During each block students also orient themselves in all kinds of professional situations e.g. visiting wards, clinics, industries, community, water and sanitation projects, to see the real cases they are studying. In all blocks, students are trained in professional skills in skills laboratory.

Approximately 20 hours in a week of educational activities are organised by the faculty, the remaining time available is for self-study, whereby students develop self-directed learning skills.

The assessment of the students is a continuous process that satisfies all general demands of tests such as reliability, validity and acceptability. It stimulates further self-directed learning, learning through practice and the integration of subject matter.

IN TUTORIAL GROUPS

The development of self-directed learning skills in problem-based learning is encouraged by confronting students with (professional) problems. Tutorial groups comprising eight to ten participants, meet twice a week during a two-hour session in which they discuss these problems. A problem usually consists of a description of a set phenomenon in some kind of explanation. The task of the group is to explain this phenomenon in terms of underlying processes, principles or mechanism (Schmidt, 1983). During the analysis of the problem, students make use of pre-existing ideas, opinions and prior knowledge. While discussing the possible explanations, students seek out what they do not know yet and what they need to learn to better understand the phenomena described in the problem. This provides them with both the direction and extent of study that needs to be undertaken to acquire a deep understanding of the problem (Barrows, 1985). To that end students generate learning issues and search for corresponding relevant literature.

Staff and a tutor whose task is to facilitate the learning process and stimulate optimal functioning of the group guide the tutorial group. The problems are contained in student's tutorial booklets, which guide the students learning activities. It also contains lists of learning resources and scheduled activities.

Problem-based learning if well implemented:

- Enhances the student's interest in the subject matter and their study achievement.
- The quality of learning materials, tutorial booklet and problems strongly influence the functioning the tutorial groups.
- This in turn influences the amount of time spent on learning.

COMMUNITY – BASED EDUCATION AND SERVICE (COBES)

Community-based education and service (COBES) is a means of achieving educational relevance to community needs (WHO 1987, 1995). In community-based education and service (COBES), students reside and train in the health facilities outside the teaching hospital, conduct research in the surrounding communities and provide service both at the health facility and in the community that is consummated with their level of study. This is under the supervision of the faculty staff and the health personnel at the health facilities where they are based.

There are five courses in COBES from 1st year to 5th year with a coordinator for each year of study. It is conducted in five of the six years of the medical programme, and all four years of the nursing and environmental health programmes.

PROGRAMME AIMS AND OBJECTIVES

AIMS

The aim is to train doctors, nurses and environmental health personnel who will efficiently and effectively initiate and manage change in health systems by exposing the students to the practical aspects of the overall functioning and management of health and the health care delivery system in the district.

OBJECTIVES

Give students a chance to practice what they have learned at various levels in the community. This way they do not use the community purely as a laboratory but they also provide service that communities and health units have often praised.
It enables all of us learners, teachers, health workers and most important the community to form partnership early in the students carrier.

IMPLEMENTATION AND STRATEGIES

CURRICULUM STRUCTURE

COBES accounts for 25-27% of all the students learning time and is integrated in each of the first 5 years for the medical (MBChB) programme and all the four years for nursing and environmental health programmes.

COBES I	-	Introduction to community health
COBES II	-	Community diagnosis
COBES III	-	Research proposal writing (part 1)
COBES IV	-	Investigative project part II (implementation of COBES III proposal)
COBES V	-	District Health services attachment

All COBES courses take six units, with the exception of COBES III which takes the whole year.

COBES I – INTRODUCTION TO COMMUNITY HEALTH

Is a six-unit introduction course to community health, undertaken by first year doctor and nursing students at the Faculty of Health Sciences, Moi University. The objective is to introduce students to community with emphasis on preventive and promotive health. It enables the student to be acquainted with community health for the first time. The concepts of community, of priority health problems and of disease control are discussed and illustrated through various techniques (e.g. small descriptive studies, rotation in a health centre, participatory observation etc).

The first two weeks of the course are spent at Faculty of Health Sciences (FHS) during which overviews and practicals regarding COBES I are given/outlined. Third to fifth week, students are based at health centres whereby they live and work in the community. The 6th week is report writing and oral presentation.

COBES II – COMMUNITY DIAGNOSIS

Applies descriptive epidemiological research methods and is centred on community diagnosis.

Second year medical, nursing and environmental health students are sent to the same stations simultaneously with common objectives and specific activities for each discipline. The students are posted to ten (10) health centres in three provinces (Rift Valley, Western and Nyanza) for three weeks. The objectives are: -

i) To acquire community entry techniques (meeting health centre staff, local administration and the community)
ii) To assess the health status of the community in relation to health care delivery services and their impact on the community.

Students participate in health care delivery service activities, based at the health centres and within the community. The activities are interventionary in nature.

COBES III – INVESTIGATIVE PROJECT PART 1

Medical, nursing and environmental health students prepare to carry out essential health research in the community or in a health facility. The research itself will be done during COBES IV. COBES III is carried throughout the year.

Reasons for learning how to do research are: -

i) Modern medicine is now based on scientific research, which is normally published in scientific journals. Students should be able to read and critically review the merits of such articles.
ii) Many research questions in the broad field of health have not been answered. Many questions emerge as the body of knowledge in medicine continues to increase.
iii) In professional life, many doctors are requested to participate in scientific research and therefore they should be able to assess the merits of those research projects in order to decide whether to participate or not.

THE CURRICULUM OBJECTIVES

Students should be able to: -

i) Explain the concept of urbanization and describe the special features that affect the health of urban communities.
ii) Identify factors that facilitate community self-reliance and describe the research techniques appropriate for identification of suitable solutions.
iii) Apply the principles of research methodology for protocol development and write a research proposal.

SPECIFIC COURSE OBJECTIVES

i) To understand the consequences of urbanisation in relation to health.
ii) Identify solutions to problems of urbanisation that involve the urban communities.
iii) Perform literature review
iv) Apply various methods to identify a relevant research topic
v) Develop and write a research proposal
vi) Present a research proposal
vii) Plan for and/or perform community interventions within the context of a research project.

COBES IV – INVESTIGATIVE PROJECT: PART II

This is the investigative part II (implementation of COBES III). Students are placed / posted in areas where they conduct the research activities basing on the problems identified during COBES I and II.

COBES V – DISTRICT HEALTH SERVICES ATTACHMENT

This is done by fifth year medical students and the program offers them opportunity to practice knowledge, skills and attitudes in a real work environment with a focus on health management issues. Students integrate their knowledge and skills in clinical, basic and social sciences. The objectives are: -

i) Analyse the administrative and management structures and services for provision of promotive, preventive, curative and rehabilitative health services at the district level.
ii) Assess the extent to which the nature and type of health services in the district address health needs of the population.
iii) Analyse the health management issues emanating from clinical practice laboratory and pharmaceutical activities in static facilities.
iv) Conceive research questions and conduct a rapid assessment that provides practical solutions to operational bottlenecks within the district.

IMPLEMENTATION STRATEGIES

The teaching and learning strategies are deliberately chosen to encourage acquisition of an integrated and holistic body of knowledge and skill through self directed learning.

PROGRAM ORGANISATION

A committee comprising staff members nominated from the three disciplines oversees the overall administration of the COBES program. The task include planning for the attachment, preparing relevant background materials for students and field supervisors (booklets, logbooks, assessment forms), orienting students and supervisors (faculty and DHMT) on program requirements, planning and overseeing assessment modalities, evaluating the program and preparing feedback to the faculty and DHMTs.

Every two years, the faculty holds a DHMT Workshop on campus for members of DHMTs in all 13 participating districts. The objective of these workshops is to develop a working relationship with the field supervisors (DHMTs) and share ideas on strategies for collaborative training and improving health services in communities where students are attached. Decisions are also made regarding the appropriate timing for field attachments.

One month before commencement of the attachment, faculty members visit the districts to distribute course materials, provide feedback, ascertain preparedness of DHMTs for training of the students, and gather relevant information to assist students to make informed choices regarding accommodation arrangements. One or two weeks before the attachment, the staff orients the students on the requirements and expectations of the COBES to be undertaken. The students also receive course booklets, logbooks and assessment forms.

FIELD LOGISTICS

The respective COBES sub-committees do placements of students in various stations. During COBES IV for Environmental Health Students and COBES V for Medical students, students select their districts of attachments among the identified thirteen districts in Rift Valley, Western and Nyanza provinces. Travel arrangements for students are made by the COBES committees for COBES I, II, and IV, apart from COBES IV (Environmental Health) and COBES V (Medical) whereby students are responsible for their travel (between the field station and campus) and accommodation.

Students work under the supervision of the members of staff and district health management teams who shall have received some introduction to problem based learning (PBL) and community based education and service (COBES).

Upon reporting to their field stations, students draw up a work plan for the three to six weeks of attachment. The general criteria for the plan are: -

> Should be comprehensive in scope; integrated in the three areas of program objectives; flexible to allow students to participate in unique activities, and include problem solving case studies during the rotations. Students must work closely with the DHMT members to produce a realistic work plan and to define priority health problems to study.

ASSESSMENT PROCEDURES

Faculty and DHMT members assess students using two formats:

i) Continuous Assessment Tests (CATS), which cover log books, DHMT and tutor assessment in the field;

ii) End of Year Examination (EYE) that includes seminar presentations, individual written reports and confidential report by District Medical Officers and Health. Each area assesses knowledge, skills, attitudes and professional ethics. In addition, students, tutors and DHMT supervisors complete program assessment forms as part of the evaluation process.

INSTITUTIONAL COLLABORATION WITH MINISTRY OF HEALTH

To foster collaboration between the training institution (university) and the main employer (Ministry of health), the faculty has held several workshops to orient DHMT members on PHL and COBES as well as to evaluate and discuss sustainability of the COBES program. Annual program evaluations reveal that members of the DHMTs are cooperative and assist students draw-up realistic work plans and find suitable accommodation. To sustain the program logistics, the two institutions should formalise linkages and draw up long-term agreements regarding the various aspects of the program.

PROGRAM INTEGRATION

Students require socialization within their own individual disciplines as well as socialization across disciplines. To engage in multi-disciplinary efforts socialization of students through joint attachments are necessary. The faculty is in the process of harmonizing all district level attachments for fifth year medicine and final year nursing and environmental health students.

INSTITUTIONAL COLLABORATION FOR RESOURCE MOBILIZATION

District level funding is often inadequate to enable students meet program objectives on outreach activities. In some instances students have limited opportunities to undertake any field activities during the attachment due to poorly maintained vehicles and/or lack of fuel. Collaboration with non-governmental organisations (NGO's) and community-based organisation (CBO's) would facilitate mobilisation of adequate resources.

STAFFING AND STAFF TURN OVER

DHMT members are expected to supervise and to sign off students against their daily log of activities; the logistics for implementation of this requirement have been elusive. Contributory factors include: high staff mobility, lack of or very few consultants to permit effective supervision of students and specific supervisors, and delegation of responsibilities to a member of staff who may not be briefed about program requirements.

SUSTAINABILITY

Suggestions to enhance program sustainability: -

i) Faculty to enter into long-term agreement with the Ministry of Health to designate a house for COBES activities thus establishing permanent COBES stations when necessary, and Moi University to undertake renovations and maintenance of such houses.

ii) There is need for active collaborative research activities/projects and income generating activities through community initiatives.

iii) Need for district health management boards to allocate a percentage of the cost sharing funds to support specific student intervention projects.

vi) There is need to identify and collaborate with viable NGOs to support travel and accommodation and community based activities of students.

These suggestions are made in view of the fact that students provide health services to the communities during their attachments.

CONCLUSION

The problem based learning (PBL) and community based education and service (COBES) program integrates training, research and practise experiences for an interdisciplinary group of trainee health-professionals (Medical, Environmental, Nursing degree programmes). Students provide essential health services to communities at risk generate demographic and epidemiological evidence to improve planning, implementation and evaluation, create opportunities for scholarly productivity for faculty and enhance leadership skills through team building and professional socialization.

A sound and modern philosophy about education as such does not suffice to bring about the desired changes in students who in future are to organise and run the health care system in the rural and urban areas.

However, the current program has deficiencies that should be addressed to enhance effectiveness of student participation. The current framework is weak because the impact on the health status of the community is minimal, there is no formal and long term institutional collaboration between trainer (Moi University) and main employer (Ministry of Health) in all matters including staffing at the training sites; and collaboration with other sectors and community based organisations for resource mobilisation is ad hoc. At the faculty level, there is no institutionalization of initiatives for sustainability and integration across programmes during attachment is partial.

RECOMMENDATIONS

There is need for reorganisation to ensure continuity of interventions that would then impact on the health status of communities through the adoption of a single community throughout their COBES courses/program to ensure consistency in learning and address the needs of the community.

The identified health problems during COBES should be documented and passed on to the relevant authority for positive action.

There is need to form long-term partnership amongst the stakeholders.

REFERENCE

COBES DIGEST, August 2201, Moi University Faculty of Health Sciences, Eldoret, Kenya.

MABEL N. N. 2001. Training Health Professionals to manage health services, students' role during District Health service attachment

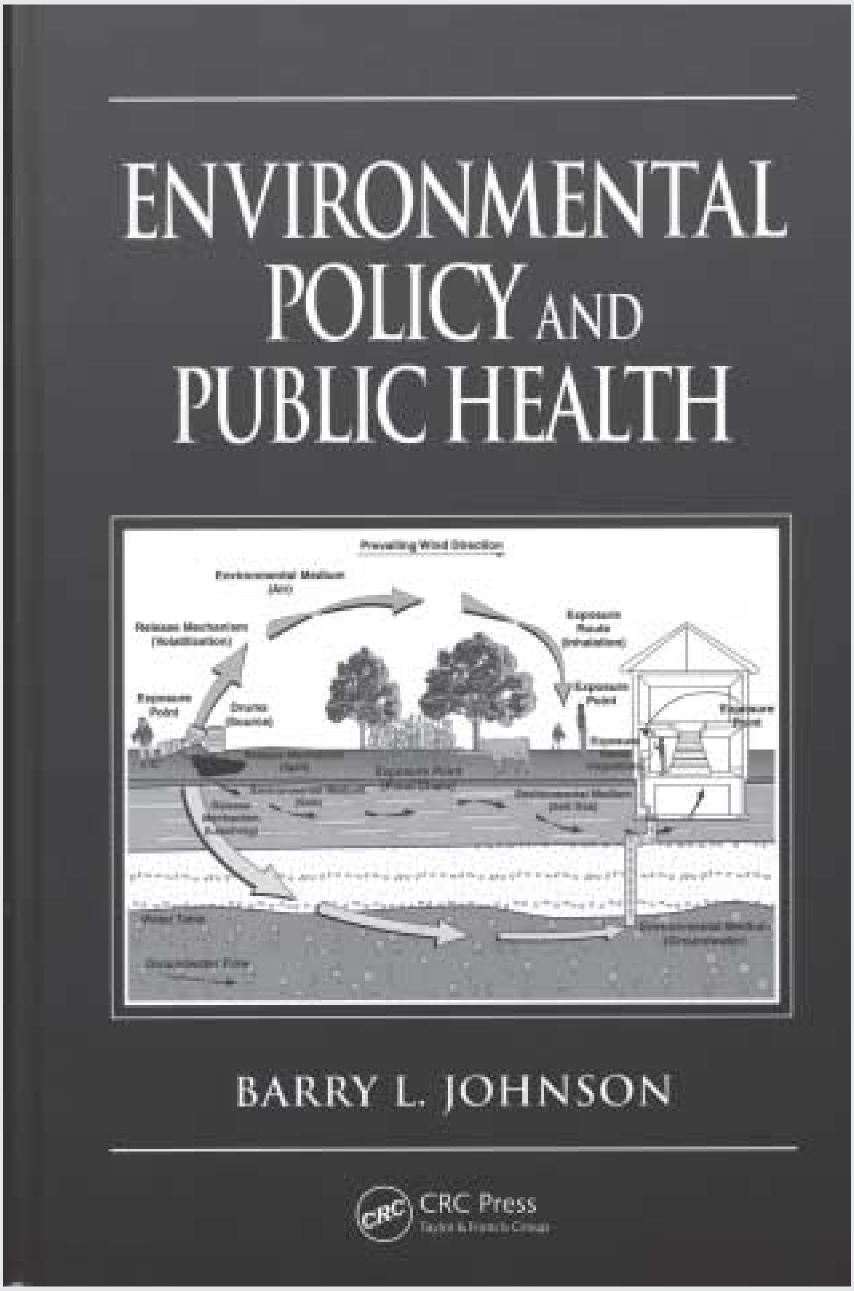
HENK G.S. ML et al. 1986. New directions for Medical Education Problem - based learning and community oriented medical education.

GIJSELAERS, W.H. & SCHMIDT H.G.Towards causan model of student learning within the context of a problem based curriculum.

P.A.J.B continuing medical education a new approach in the Netherlands

P.A.J.B Problem based learning as an educational strategy.

BOOK REVIEW



Environmental Policy and Public Health by Barry L Johnson is one of these books that all Environmental Health Professionals will want to keep near them. The author's easy style of prose makes it a most readable and understandable book, covering the fundamentals of environmental policy.

Whilst the book is based on US statutes the part that international environmental health organisations plays are fully described.

The full range of Environmental Policy and Public Health is covered in detail and will prove to be a valuable reference source for the future. Whilst it looks at the history of Environmental Health it is very much a tool for living in the present.

An innovative idea is the posing of questions at the conclusion of each chapter thus inviting the reader into fuller participation

ISBN 0-8493-8434-6
Further information from www.crcpress.com