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Content Analysis of Research Contributions towards Environmental Issues in Sindh

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Abstract
This research article identifies the contributions of PhD faculty members of Higher Education Institutions (HEIs) in Sindh Pakistan offering degrees in the environment discipline through published articles in journals, conference proceedings, research project reports and focused areas of research. The content analyses of curriculum vitae data of PhD faculty members is carried out in this article. As an outcome a methodology is developed which compares the conducted research with existing environmental issues existing in Sindh Pakistan. In total, 696 research contributions of PhD faculty members of HEIs offering degrees in field of Environmental Engineering & Environmental Sciences were explored. The PhD faculty members have disseminated their research by publishing 192 articles in international and 148 in national journals, presenting 71 papers in national and 117 papers in international conferences, 146 research project reports and 22 scholarly books. This research has identified different focused research areas chosen by PhD faculty members related to environmental issues in Sindh such as Waste Management, Water Quality, Environmental Resource Management, Water Management, Plant Biodiversity, Renewable Energy, and Air Pollution. While environmental issues in Sindh such as; Marine Pollution, Noise Pollution, Desertification, Deforestation, Agrochemicals, Sea Intrusion, Risks of Oil Spills at Ports, Climate Change, Global Warming, Ozone Depletion, and Acid Rain remained less focused by those PhD faculty members. This research concluded that larger numbers of research papers are published related to different environmental issues in Sindh but yet these problems remained unsolved. The finding suggests that academic research is making less impact on solution of local problems.
Keywords: Research Contributions, Academic Biographies, HEIs, PhDs. Qualitative Content Analysis

1. Introduction

Higher education institutions (HEIs) have emerged as the base of knowledge in the knowledge based economies. HEIs are seen as responsible to fulfill the present and future needs of society in terms of highly qualified human resource and scientific knowledge (Lashari et al., 2013). This research identifies the existing capacity of scientific contributions of HEIs of Sindh Pakistan in field of environment and assesses their relevancy with the environmental issues in Sindh Pakistan. This geographical area is chosen because of diverse environmental resources including large coastal line, fertile land, River Indus, large canal system of world, Oil, gas and coal reservoirs (Sindh Investment Board, (2014).

Pakistan government has established Environmental protection agency (EPA) which is a governing body related to environmental issues and is working at the national and provisional level. EPA working in Sindh province called SEPA (Sindh Environmental Protection Agency) is responsible for protection of environment, providing solution of environmental problems, effective utilization of environmental resources & search for the alternative resources to protect environment.

This research focuses on identification and classification of research contributions of PhD faculty members of HEIs in Sindh offering degrees in the environment discipline. Research contributions of PhD faculty members are classified by using content analysis. Finally this research offers methodology which compares focused research areas chosen by PhD faculty members with existing environmental issues in Sindh Pakistan.

This research contains different parts of discussion including background of study discussing environmental issues in Sindh Pakistan, HEIs in Pakistan, role of higher education institutions described in the literature and methodology used in this research. In the end, obtained results, conclusions and recommendations are also presented. Following section presents the background of study.

2. Environmental Issues in Sindh

Continuous growth of industrialization and urbanization is making harmful effects on the environment and causing different environmental problems. Karachi located at Sindh province of Pakistan is one of the top 10 cities of the world which has the highest level of pollutants packed into the air. Air pollution is affecting health of common men. People often suffer in respiratory diseases like asthma, lungs diseases and cancer etc (Siddique et al., 2013). Dumping municipal and industrial waste in the coastal areas is damaging coastal ecosystem, vehicle & industrial emission are causing air pollution; pesticides usage in crops are causing land pollution. Many other modes of pollution are also damaging natural environment in Pakistan (EPA, 2014).

Source: SEPA, 2015

Figure 1. Garbage dumping at the Karachi City's Beaches

In order to protect environment there is an alarming need to adopt certain techniques in healthy ways. Nations are dependent on HEIs in terms of knowledge because in the changing world, which is increasingly adding uncertainty, all higher education institutions are responsible to provide favorable responses to social needs (Lashari et al., 2014). Sindh province is facing different environmental problems identified by Environmental & Alternate Energy Department, Government of Sindh, both at local and global levels (detail of problems is given in table 1).

Table 1. Environmental Issues in Sindh Pakistan

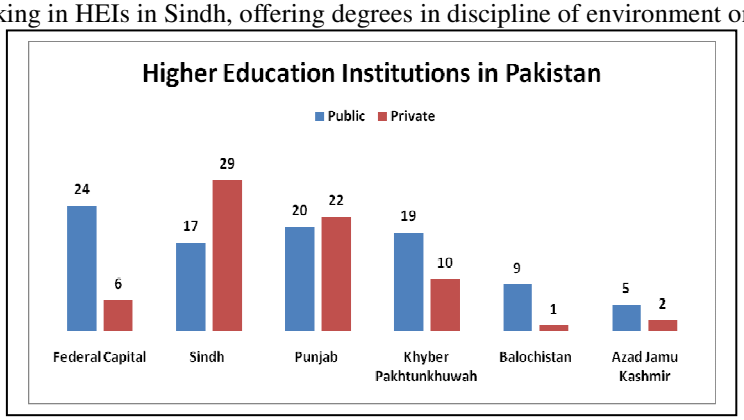
Local Level	Global Level
Air Pollution	Climate Change
Drinking Water Contamination	Global Warming
Domestic & Industrial Wastewater	Ozone Depletion
Marine Pollution	Acid Rain
Municipal & Industrial Solid Waste	Loss of Biodiversity
Hospital Waste	Environmental degradation
Industrial Hazardous Waste	
Noise Pollution	
Desertification / Deforestation	
Agrochemicals	
Biodiversity under severe degradation /destruction	
Sea Intrusion	
Risks of Oil Spills at Ports	

Source: Environmental & Alternate Energy Department Government of Sindh, 2014

3. Higher Education Institutions in Pakistan

Higher education institutions are considered as responsible for development of country in the different fields. HEIs produce fresh graduates in terms of skills and research and development in terms of knowledge which serve for solution of problems and growth of society.

Higher education institutions in Pakistan are categorized on the basis of geographical location and their affiliation with the national and provisional government. In Pakistan, Sindh and Punjab provinces show larger number of HEIs (HEC, 2015) as shown in figure 2. This research is focused on research contributions of PhD faculty members working in HEIs in Sindh, offering degrees in discipline of environment only.



Source: HEC, 2015

Figure 2. Location wise distribution of HEIs in Pakistan

4. Emerging Role of Higher Education Institutions (HEIs)

Institutional capacity building and human resource development as related field are following the third mission shift from both the internal development of the university and external influences on academic structures associated with the emergence of 'knowledge-based' innovation (Etzkowitz et al., 2000).

Now days universities themselves have to continuously improve their teaching and research capabilities in order to be able to meet the societal needs. Universities are the core for knowledge production by producing scientific research, which is systematic, controlled, empirical, amoral, public and critical investigation of natural phenomena. It is guided by theory and hypotheses about the presumed relations among such phenomena (Kerlinger & Lee, 2000).

In changing world, which is increasingly adding uncertainty, all higher education institutions should provide favorable responses to social needs and it has proven by experiences that universities can provide best services to the community if they have concerns of continues improvement in the quality of their service (Yarmohammadian et al., 2011).

The quality of higher education institutions are directly related to research. Academic research conducted in the HEIs plays very important role for the scientific progress of any country. "The quality of higher education is fundamental to a country's development because universities are the ones that prepare professionals" (Oliveira & Ferreir, 2009). While discussing the competitive value of universities, Yarmohammadian et al., 2011, articulates that universities provide the basis for dynamic competition of a country in region and in the world and universities are also considered as the main measure of progress.

4.1 The Role of PhD faculty in HEIs

The work of the faculty in higher education institutions has traditionally been trifocal, consisting of teaching, research and community service extension. University faculty members are required to become teachers, researchers, and service oriented professionals, to achieve future demands. The faculty members of HEIs at higher qualification level as PhDs are expected to be the primary producers of research in universities.

Research is considered as blood for advancement of human life in the present world scenario. It is significant to understand that research is designed to solve particular existing problems, so there is much larger audience eager to support research that is likely to profitable or solve problems of immediate concern. That is reason; universities in developed world have a firm tradition of research (Ardakhani et al., 2011).

Recognizing research as an important part of their responsibilities, faculty members of higher education institutions have consistently evidenced research productivity with other factors that contribute to the process. Research can be defined as, the continuous application of a particularly coherent and systematic and reflective way of questioning, as a mode of interrogation (Naeem, 2015).

5. Data source and Methodology

This research is exploratory in nature. To collect the required data related to HEIs offering degrees in field of environment in Sindh Pakistan and their PhD faculty members, official websites of HEIs of Sindh Pakistan (48 total in number) have been searched during March, 2014. From collected information 8 HEIs with 24 PhD faculty members have been identified with two group of offered degree programs of environment discipline such as; environmental sciences and environmental engineering. Detailed curriculum vitae data of PhD faculty of HEIs offering degrees in field of environment have been collected by contacting PhD faculty members of HEIs in Sindh offering degrees in field of environment through direct/telephone/email during April 2014 to September 2014. Qualitative content analyses of curriculum vitae data have been done in this research.

Content analysis is a research methodology which examines textual data for patterns and structures, singles out the key features to which researchers want to pay attention, develop categories, and aggregate them into perceptible constructs in order to seize text meaning (Vitouladiti, 2014). The methodology used in this research follows qualitative content analysis method as biographies of 21 Alzheimer disease patients had been analyzed using content analysis to find out common patterns and to compare them with 11 vascular dement patients of the same age (Phillip, 2000). Qualitative content analysis used in this research based on curriculum vitae data of PhD faculty members as a case study as Fraenkel & Wallen (2006) describes that a biographical study is the study of a single individual and his or her experiences as told to researcher or found in documents and archival material.

Qualitative content analyses of curriculum vitae data of PhD faculty members have been done manually by authors and identified themes of research contributions were extracted. After collecting themes of research contributions these were reviewed and categorized with the help of different glossaries as; Glossary of environmental terms by Natural Resources Defense Council (NRDC), Ecology Dictionary INDEX, Environmental Glossary. Identified themes were classified into different broad categories. At the end, identified areas of research contributions have been compared with the existing environmental issues in Sindh.

6. Data Analysis and Results

Research contributions produced by PhD faculty members in HEIs of Sindh are assessed in terms of publishing years, mode of dissemination, and focused research areas. At the end focused research areas are compared with existing environmental issues in Sindh. Detailed results are discussed below.

6.1 Yearly Flow of research Contributions of PhD faculty members

Research contributions of PhD faculty members have been found from 1986 to onwards, research contributions is continuously increasing but number of research contributions have visibly increased from 2004 by publishing 48 research contributions.

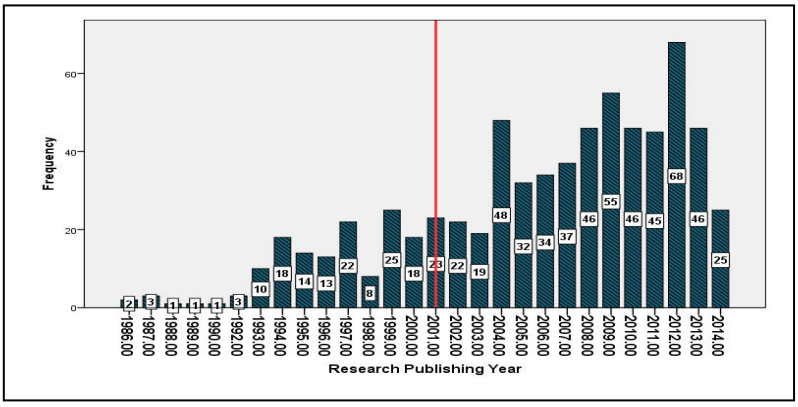


Figure 3. Year wise flow of research production by PhD faculty members

6.2 Modes of research dissemination in the academic community

Results related to dissemination types of research contributions of PhD faculty members in HEIs of Sindh offering degrees in field of environment shows different modes of research dissemination. PhD faculty members have published 197 articles in international and 148 in national Journals. PhD faculty members have presented 117 national and 71 international conference papers, 146 research project reports and 22 scholarly books.

Publication of international journal articles shows larger numbers than other research contributions types. Scholarly books and national conference papers show less number than the other research dissemination types of PhD faculty member in HEIs of Sindh offering degrees in field of environment (detailed results are shown in figure 4).

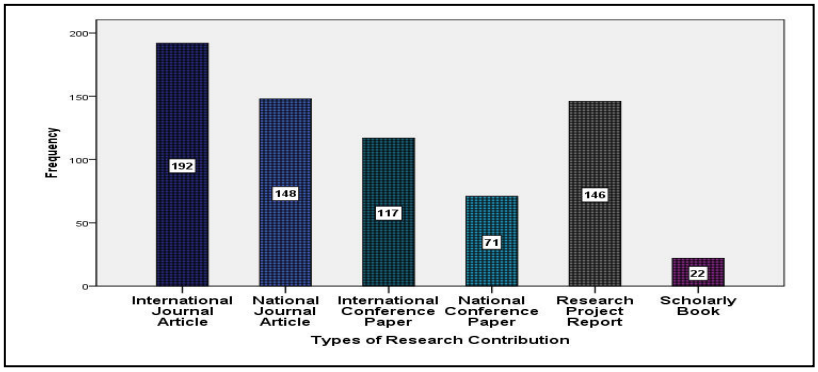


Figure 4. Research Dissemination Types

6.3 Categorization of Research Contributions of PhD faculty members in HEIs of Sindh offering degrees in field of Environment

Environment discipline comprised of various types of knowledge related to different components of environment. Capacities of HEIs in terms of research knowledge are explored using content analysis to identify relevant capacity to solve the environmental problems particularly environmental issues in Sindh.

Relevancy of research contributions of PhD faculty members have been assessed by using qualitative content analysis. Research contributions focusing on the experiments/observation/assessment/problems related to different environmental issues is categorized by selecting their themes and then explored on the bases of definition given in the selected search glossaries. Research contributions of relevant themes were grouped together.

This research has explored larger number of research contributions produced related to waste management and water management (71 in number). 67 were related to water quality, 62 were related to environmental resources management; 55 were related to plant biodiversity and 52 were related to renewable energies and research contributions have been found related to many other research areas such as; Air Pollution, Water Policy, Climate Change, Energy Policy, Health and Safety, Environmental Policy, Institutions

development, soil management, Transportation and Water Pollution, numbers of these research areas are given in detailed in figure 5.

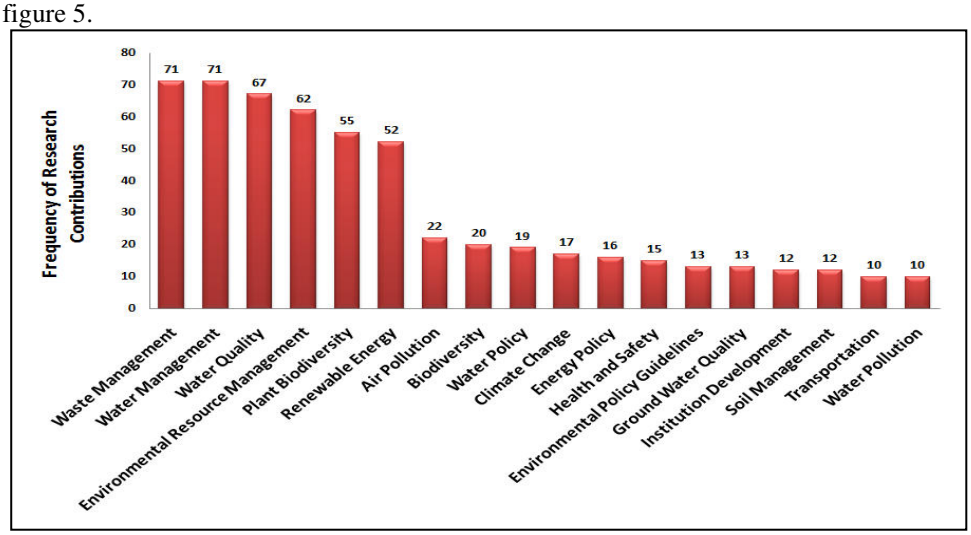
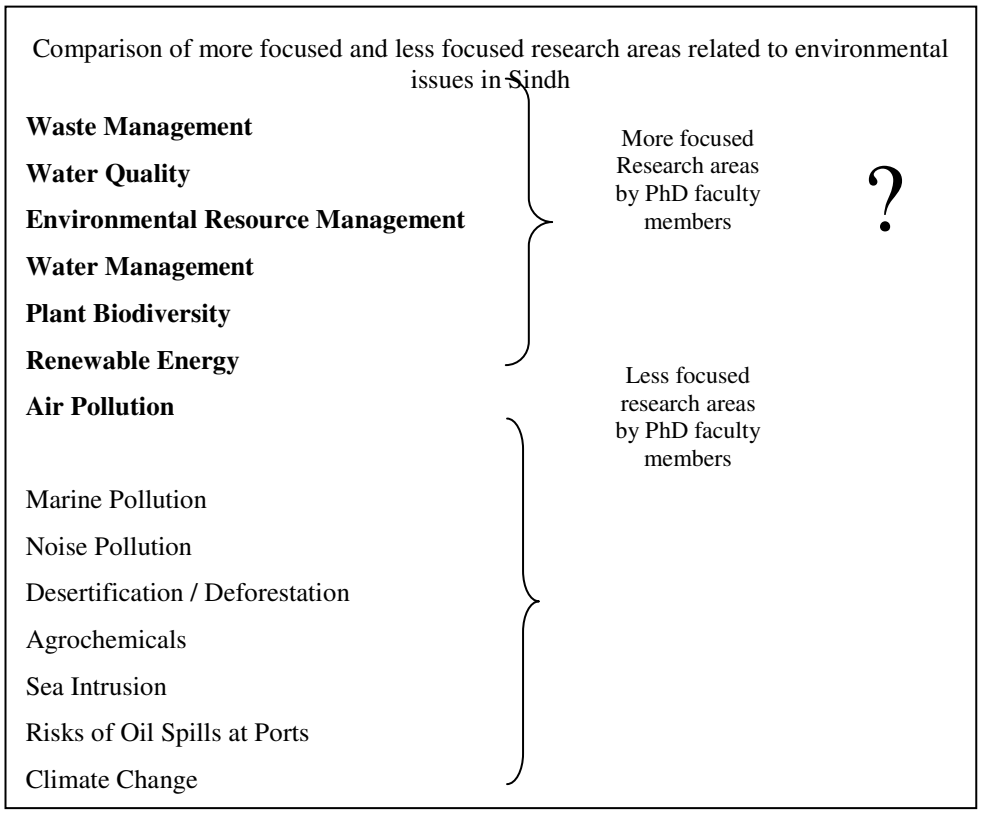


Figure 5. Focused Research Areas

6.4 Comparison of focused research areas with environmental issues in Sindh

Capacities of HEIs in terms of research knowledge are explored using qualitative content analysis to identify relevant capacities to solve the environmental issues in Sindh. Result shows research contributions related to environmental issues in Sindh such as research areas related to Waste Management, Water Quality, Environmental Resource Management, Water Management, Plant Biodiversity, Renewable Energy and Air Pollution.

As research contributions related to different environmental issues in Sindh have been found but at the same time question arises here is that; why still these problems show alarming need to be solved? Clearly, it shows that research done so far in academic in nature and is having less impact on society. It is observed that research contributions of PhD faculty members are less focused related to; Marine Pollution, Noise Pollution, Desertification / Deforestation, Agrochemicals, Sea Intrusion, Risks of Oil Spills at Ports, Climate Change, Global Warming, Ozone Depletion, Acid Rain. These environmental issues must be focused in future by the faculty members. Detailed results are shown in figure 6.



7. Discussion and Conclusions

This research has presented the research capacities of expertise of HEIs in Sindh in the field of environment. From 8 HEIs in Sindh offering degrees in field of environment 5 offers degrees in discipline of environmental engineering which is often presumed to focus on technologies for elimination of environmental pollution (Reible, 1998). Other three HEIs are offering degrees in discipline of environmental sciences which are concerned with changes wrought by human activities and their immediate and long-term implications for the welfare of living organisms including humans (Michael, 2000).

In terms of highly qualified human resources in HEIs offering degrees in field of environment there are 24 faculty members having PhD qualification. Both type of HEIs offering degrees in environmental engineering and environmental sciences have 12 in numbers to fulfill research needs in the field of environment. HEIs in Sindh are not offering degrees in other related offered degree programs such as environmental policy, environmental management and environmental economic etc.

PhD faculty in the HEIs of Sindh have disseminated their research contributions in different modes as publishing articles in international/national journals, presenting papers in national/international conferences/workshops, scholarly books and research projects. These all modes are more focused towards academic community and less on research commercialization. Patents have not been granted to PhD faculty members in HEIs of Sindh offering degrees in field of environment. Result shows that higher education policies in Pakistan are more focused on academic knowledge dissemination towards the academic community. Policies related to higher education in Pakistan must focus on the commercialization of research by developing supporting mechanisms.

Identified existing research capacities of PhD faculty members of HEIs offering degrees in environment discipline are relevant with environmental issues in Sindh including; Waste Management, Water Quality, Environmental Resource Management, Water Management, Plant Biodiversity, Renewable Energy and Air Pollution. HEIs in Sindh offering degrees in field of environment now need to focus on less focused environmental issues in Sindh such as; Marine Pollution, Noise Pollution, Desertification/Deforestation, Agrochemicals, Sea Intrusion, Risks of Oil Spills at Ports, Climate Change, Global Warming, Ozone Depletion to fulfill the research capacities to solve these problems.

As research has found a decent number of research contributions related to different environmental issues in Sindh but it is also observed that these problems are still need to be solved. It shows that academic research is not making impact for the solution of local problems at the efficient level. Research knowledge should be focused and utilized for the local development in future by strengthening knowledge infrastructure for the development of society.

Policy making and funding bodies of higher education must formulate policies to maximize the usage of scientific capacities of HEIs in terms of graduates and research knowledge to enhance the role of HEIs in national development. Funding bodies must provide infrastructure and financial resources to faculty for the solutions of environmental problems relevant to their expertise. Policy making organizations must consider the need of relevant expertise and research capacity at the initial stages of funding of scholarships and research project grants. It is necessary to produce relevant human resource and knowledge for the solution of problems faced by local community. Production and utilization of relevant human resource and research knowledge can help to minimize the problem of unemployment of graduates by creating need based new job markets for development of societies. Research done by local experts can be used to solve local problems through new scientific techniques at low cost.

This research has only identified research capacities in the HEIs offering degrees in field of environment. In future researchers can explore capacities in other academic fields and can categorize existing capacities by using the content analysis methodology used in this research. This research has identified capacities in terms of research contributions in field of an environment; future research needs further exploration in detail to identify relevancy of physical capacities of HEIs with societal needs in Sindh.

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