IMPACT OF MARINE OIL SPILLS TO SRI LANKA AND IT'S NUMERICAL MODELLING

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This thesis was submitted to the Department of Civil Engineering of the University of Moratuwa in partial fulfilment of the requirement for the Degree of Master of Science.

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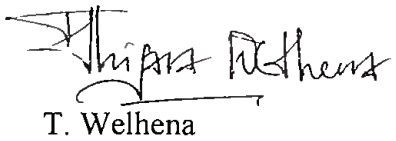
August 2004

Declaration

The work described in this thesis has carried out in the Department of Civil Engineering, University of Moratuwa, Sri Lanka, under the supervision of Prof. S.S.L. Hettiarachchi and Dr. S.P. Samarawickrama.

The author wishes to declare that, except for commonly understood ideas, or where specific reference has made to the work of authors, the content of thesis has his original work and include nothing, which is the outcome of work done in collaboration. The work has not been previously submitted, in part or in whole to any other university for any degree, diploma or any other qualification.



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October 2004

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Abstract

Over the last couple of decades there has been a growing concern regarding the marine pollution due to spill of oil from ship operations and accidents. This is because the oil spills have devastation and obnoxious effect on marine ecology, which may not be recovered. Hence, there is a need for analyzing or predicting the movement of spilled oil slicks.

The occurrence of oil spills is fundamentally a matter of probability. There is no certainty regarding the amount of oil that would be transported, or the size or likelihood of a spill that would occur, during the period where the predication is carried out. Neither can the winds and ocean currents that transport oil spills be known for certain. A probabilistic event such as an oil-spill occurrence or oil-spill contact to an environmentally sensitive area cannot be predicted with certainty. Only an estimate of its likelihood (its probability) and the vulnerability of such sensitive resources can be quantified.

Such estimations can easily be done with the help of advanced computer modelling techniques. Numerical models have various aspects and various modelling methods based on the level of the accuracy required by the purpose it is being used.

In this study, impact of marine oil spills to South west coast of Sri Lanka has been investigated using available numerical modelling techniques combined with a set of available environmental data. The extensive amount of modelling work was carried out in areas where the overall sensitivity of the coastal zone is high.

OILMAP _4, an oil spill probability and fate model developed by Advanced Science Associates of USA has been used for all the modelling work and in house model developed by Wijeratne (1997) was used for exploring the numerical modelling techniques.

Having identified the areas most exposed to potential oil spills, the methodology was proposed to assess risk involved in each area by a method of risk score allocation. Such a scoring method directly reflects the level of attention need to pay regarding preventive measures and planning for response operations.

Based on the results of modelling and risk assessment there is a strong and urgent demand for well prepared plan to meet those circumstances. Hence scope of the study is extended to identify the requirement of an oil spill contingency management plan and its development guidelines.

Acknowledgement

This report is an outcome of full time research based masters degree programme in engineering conducted in the department of civil engineering, university of Moratuwa from 2003 Aug to 2004 Aug. I put my fullest attempt in order to achieve this exercise a successes. Even though this report was produced by me as a post graduate student there were lots of academic members, individuals and organizations involved in the entire process in national scale. All supervisors, examiners and other colleagues who not only made provisions for the ease of my research activities but also gave very good constructive criticisms to improve whole process are highly regarded.

First and foremost I would like to pay my sincere gratitude to professor S.S.L Hettiarachchi, as my supervisor and Dr. S P Samarawickrama, as my second supervisor from University of Moratuwa for their for their remarkable supervision throughout the study period.. Especially to Dr. Samarawickrama, this whole attempt would not have been a success without your tireless effort and invaluable guidance right through out the programme.

Secondly I would like to express my sincere thanks to my external supervisor Dr. NMT Wijeratne from Faculty of Engineering University of Ruhuna for your invaluable information in numerical modelling and true dedication for examining me even coming from Galle.

Also I should obliged to my external examiner Dr. AGT Sugathapala, for your kind intervention in examining this programme and supervising right through out.

I should specially thank all my supervisors and examiners for their invaluable co-operation in correcting this report event at a short notice and short period of time.

This is a project fully sponsored Asian Development Bank funding programme for higher studies in Sri Lanka. All the financial support was given to me by the ADB funding programme and provision of facilities and coordination given to me by the Director of the postgraduate studies. So my heartiest thank should go to Prof (Mrs.) M.N. Ratnayake and her supportive staff members.

Finally my grateful thank goes to all the colleagues who shared coastal research room with me for their advice and encouragement and all the non –academic staff members for their various supports and any other whose names I couldn't mention. I should also remind the Capt. O.L. Samaranayake for his kind support in developing real life scenarios for modelling.

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