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Development of FEPs and Scenario for the Safety Assessment of LLW Disposal Facility in Pakistan

[1*]JAVED IQBAL, [2]ASAD EJAZ, [2]Dr. Muhmood ul Hassan, [2]M. Kamran Siraj

[1,2] Pakistan Nuclear Regulatory Authority, Islamabad, Pakistan

*javed.iqbal@pnra.org

1. INTRODUCTION

Pakistan is establishing a Vault type Near Surface Disposal Facility (NSDF) about 6.5km^2 for low level radioactive waste (LLW) from Chashma Nuclear Power Generating Station, Research Reactors, Hospitals, and other generators in North of the country.

The proposed site shown in figure-1 is semi-arid conditions, non-permeable strata (clays of Chinji Formation), low environmental impacts (including flora and fauna), low seismicity impacts, no chances of riverine flood, and low population density.

Fig. 1 – Site for NSDF in Pakistan

Features, Events and Processes (FEPs) have the key importance in safety assessment (SA) of disposal facility. Keeping in view of the waste form and type of the disposal facility, the FEPs are identified, screened out and develop a scenario which will be used in the SA of a NSDF. This poster presents the overall process of development of FEPs and scenario for the SA of NSDF.

2. DEVELOPMENT OF FEPs

Safety Assessment Report (SAR) of NSDF ensure the safe operation of the facility and will remain safe after its closure over a long period of time such as three hundred (300) years. SAR mainly addresses the radiological impact on humans and the environment in terms of radiation dose/risks from the disposal facility.

SAR consider a wide range of factors that could potentially affect the disposal facility, contaminants arising from it and its environment over the time periods of interest. These factors may be Features (waste type, rock thickness) of disposal facility, Events (glaciations, droughts, earthquakes, or formation of faults) or Processes (erosion, subsidence, sorption), and are known collectively as FEPs.

♦ Identification of FEPs

The first step is to identify FEPs relevant to NSDF. There is considerable international precedent for developing a list of potential FEPs appropriate to the study for the SA of disposal facility. Following a review of potentially relevant FEP lists from the IAEA, OECD/NEA, and NWMO/OPG documents [1, 2, 3, 4], FEPs have been identified relevant to the proposed site.

♦ Screening of FEPs

Screening determine the relevancy of FEPs based on the potential impact of FEPs to the disposal facility. Screening of FEPs list is carried out on the basis of assessment context and system description and the criteria used is given in Fig. 2:

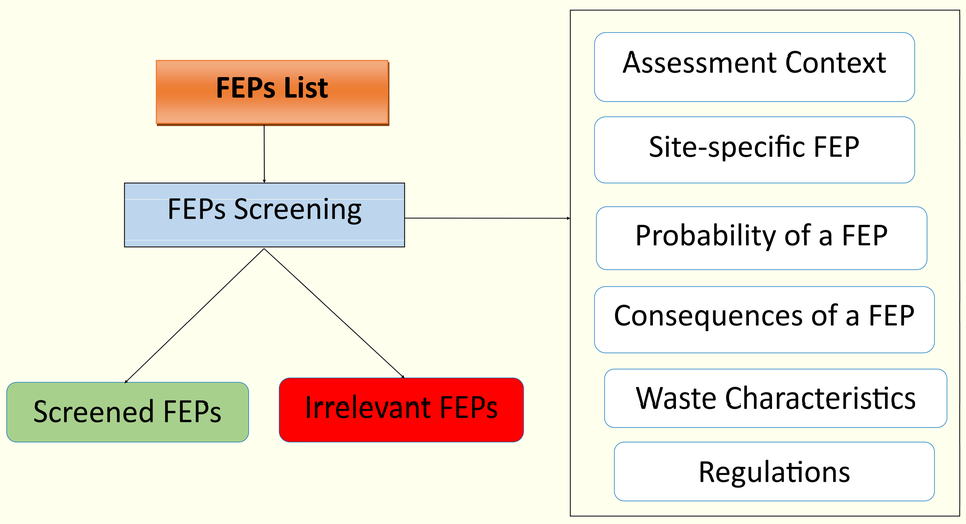

Figure 2: Criteria for Screening of FEPS

After screening, similar FEPs are grouped to form Integrated FEPs given in Fig. 3 such as site investigation, design, schedule and planning, construction, operation, waste allocation, closure, quality assurance, disposal facility administrative control, records and markers, surveillance and monitoring, etc. are grouped in to disposal facility factors. Iteration process is used for the developments of FEPs.

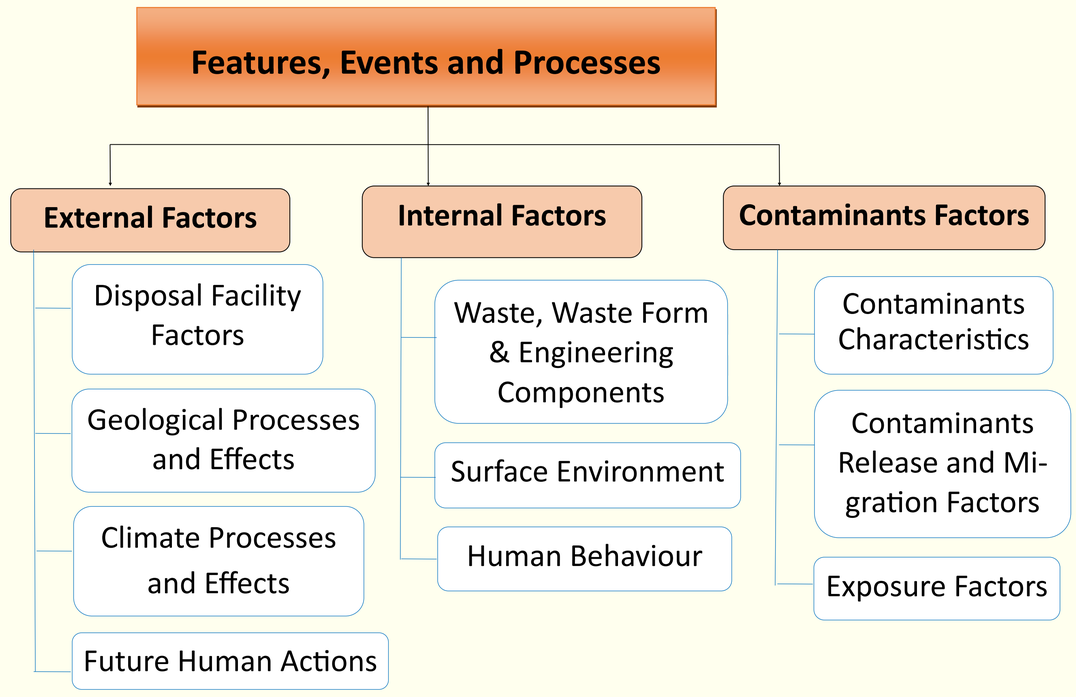

Fig-3: Categorization of FEPs

3. DEVELOPMENT OF SCENARIO

A scenario is a sequence of processes and events, and is one of a set devised for the purpose of illustrating the range of future behaviors and states of a disposal system, for the purposes of evaluating SA. An example of scenario 'Human Intrusion' is given in Fig. 4.

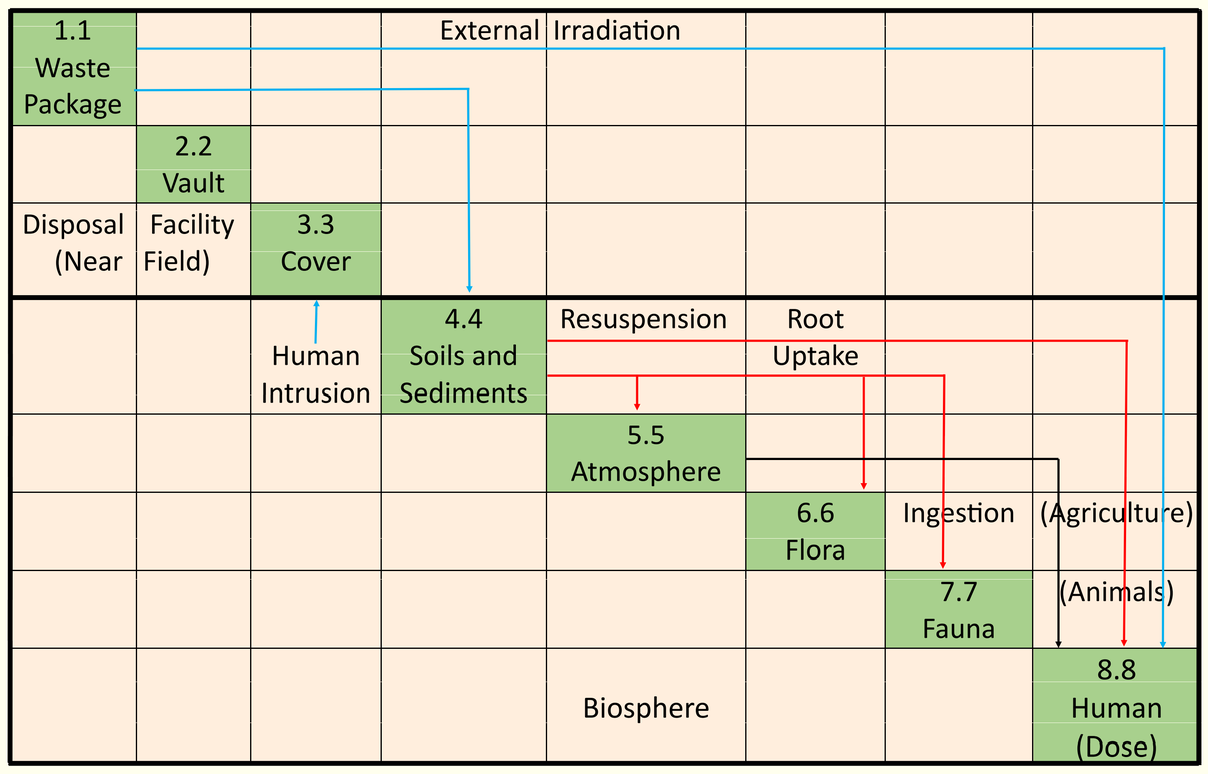

Fig-4: Human Intrusion Scenario

The administrative measures, and time period, used to control events at or around the facility during the operational period can be strict however, after its closure, it is possible that control may remain tens of years to prevent inadvertent human access and after that it is possible that controls are no longer effective and cause human intrusion due to development of the site at the location of disposal facility. This will eventually lead to the destruction of the disposal facility and can cause the release of contaminants to the biosphere which will be harmful to the human beings and also can affect the environment.

4. CONCLUSION

From this study, FEPs relevant to NSDF are identified, screened out and developed scenario of human intrusion which provides basis for scrutiny of the logic of the underlying assumptions leading to the safety assessment of facility. In the next step, the assessment context and relevant assessment methods will be developed for the scenarios so that the safety assessment of near surface disposal facility can be performed.

5. REFERENCES

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[4]. Features, Events and Processes for Geologic Disposal of Radioactive Waste, An International Database by the Organization for Economic Co-operation Development (OECD)/ Nuclear Energy Agency (NEA), 1999

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