

THE INSTITUTIONAL FRAMEWORK FOR ESTABLISHING A MULTINATIONAL RADIOACTIVE WASTE DISPOSAL SYSTEM: A DEVELOPING COUNTRY PERCEPTIVE

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ABSTRACT

An overall institutional framework is proposed for establishing a multinational disposal system embodying all the essential conditions, checks and balances for the successful achievement of technical efficiency, societal legitimacy and stakeholder trust. The challenges posed by the implementation of this concept in developing countries are examined, taking into account the specific sensitivities in such countries to acceptance of foreign radioactive waste. As a consequence, the likelihood of developing countries acting as potential hosts of multinational disposal systems should not be overestimated.

INTRODUCTION

Currently the management of radioactive waste still centers on national strategies for waste collection, treatment, interim storage and disposal. To date, multinational cooperation on radioactive waste disposal has been actively pursued, but remained largely limited to the area of R & D. This tendency to focus exclusively on national strategies reflects the political sensitivity of multinational cooperation in the area of radioactive waste disposal.

It is an internationally accepted principle that a country enjoying the benefit of nuclear energy or the utilization of nuclear technology should also take full responsibility for managing the radioactive waste generated by these activities. This principle, however, does not necessarily imply that each country should exclusively develop its own national repositories regardless of the technical, economic, financial and institutional implications. What is required of each country is to fully accept its national responsibility for the management of its radioactive waste. The approach to discharging this responsibility may include multinational collaboration.

For those countries interested in multinational collaboration on radioactive waste disposal certain institutional conditions need to be satisfied to ensure successful implementation. Institutional conditions are the prerequisites for establishing a multinational disposal system as an acceptable and conventional practice within civil society. This paper attempts to define an overall institutional approach to multinational disposal of radioactive waste in the context of developing countries.

Successful implementation of the multinational disposal concept in developing countries requires resources that are not usually associated with such countries. There are also constraints of a socio-political nature, such as the typical sensitivities in the developing world to the acceptance of foreign waste. In the following discussion “developing countries” are referred to as a generic group of countries being in a state of technical, economic and socio-political development. The characteristics attributed in this paper to these countries tend to be speculative and are largely based on opinions formed by the author. It is suggested that a scientific survey of developing countries be undertaken to gauge their willingness to act as potential host countries within a multinational disposal system.

HISTORICAL MULTINATIONAL ARRANGEMENTS

There have been several initiatives in the past between countries aimed at cooperation in the management and eventual disposal of radioactive waste: From 1950 to 1976 the UK and French reprocessing facilities

accepted spent fuel with no requirements to return the wastes. The former USSR delivered fuel to its satellite countries and accepted spent fuel for reprocessing and disposal. From 1997, the UK and French reprocessing facilities agreed with their customers to substitute or swap various wastes resulting from reprocessing. The USA agreed to repatriate spent fuel from research reactors until 2006.

MULTINATIONAL DISPOSAL CONCEPT

Multinational disposal is based on the concept that waste, originating from more than one country (“Partner Countries”), is disposed of in a common repository in one particular country (“Host Country”) [1]. Apart from the host and partner countries, other countries (“Third Party Countries”) may also have an interest in the multinational repository system, such as countries making their territory available for the shipment of waste from the partner countries to the host country [2].

The essential element of the disposal system is the repository in which the radioactive waste is emplaced, either on a permanent or a reversible basis. Both near-surface as well as deep geological repository concepts lend themselves to implementation within a multinational disposal system. Near surface disposal systems for low and intermediate level waste are being implemented worldwide, albeit on a national basis, but progress on deep geological disposal concepts has to date not come to fruition.

Currently there is international concern about the management of disused radioactive sources posing a serious security threat in terms of terrorist attacks. Various methods of securing such sources are being investigated with the emphasis on disposal concepts. The IAEA is currently studying the borehole concept with a view to implementation in especially developing countries that have difficulties in managing their disused radioactive sources. Although the borehole is a relatively simple disposal system designed to be used by countries for their own purposes, the system may also be implemented on a multinational basis. Boreholes may serve as a useful starting point for demonstrating the feasibility of a multi-disposal system.

THE MULTINATIONAL DISPOSAL SYSTEM

The National System

A highly simplified model representing civil society within a national context is used to analyse the typical interactions or relations between countries participating in a multinational disposal system. The model, depicted in Figure 1 [3] consists of three autonomous spheres of human activity, namely, the socio-cultural sphere (“The Public”), the legal-political sphere (“The State”) and the techno-economic sphere (“The Economy”). The model reflects the celebrated ideals respectively of “freedom”, “equality” and “brotherliness”. The typical interplay between the three autonomous spheres within the national system is apparent from Figure 1. The model represents a self-sustainable social system within a national democratic constitutional framework. The typical divisions of power, i.e., the legislature, the executive and the judiciary characterize the “State”. The “Economy” comprises the relevant organizational entities involved in technology, commerce, economics and finance. The “Public” is a collection of individuals and associations that operate within a social and cultural context, such as for example, in education, art, science, religion, etc. It is desirable that a free press should cover the activities in all three spheres.

The Multinational System

Using the national system as a basic building block, a multinational system can be constructed that consists of a number of independent countries collaborating within a multinational radioactive management system. The scheme depicted in Figure 2 illustrates the typical interactions between the hosting country, its partner countries and possible third-party countries within a multinational system.

These interactions form a logical hierarchy of relations cascading down from the legal –political level, through the sociological level down to the techno-economic level. These multinational relations need to be formally established within an institutional framework involving the host, partner and third party countries for the successful realization of the scheme.

MULTINATIONAL INSTITUTIONAL REQUIREMENTS

In general, the institutional requirements for the successful development of a multinational repository can be derived from Figure 2. These requirements are sub-divided into three parts: i.e., the *intra*-national, the *international* and the *supranational* requirements. The first part includes the requirements pertaining to the participating countries themselves, the second, the requirements governing the relations between the participating countries and the third, the requirements imposed on countries by established structures existing among a group of countries.

Intra-national Requirements

Enabling Legislation: Host and partner countries need to make provision in their respective national legislative frameworks for legislation enabling participation in a multinational system. This is particularly necessary in view of the political sensitivity and long-term nature of a typical multinational disposal project. Such enabling legislation would provide the necessary confidence for the parties to move forward with the project. Third-party countries, potentially affected by the implementation of the scheme, may require legal assurances from the host and partner countries.

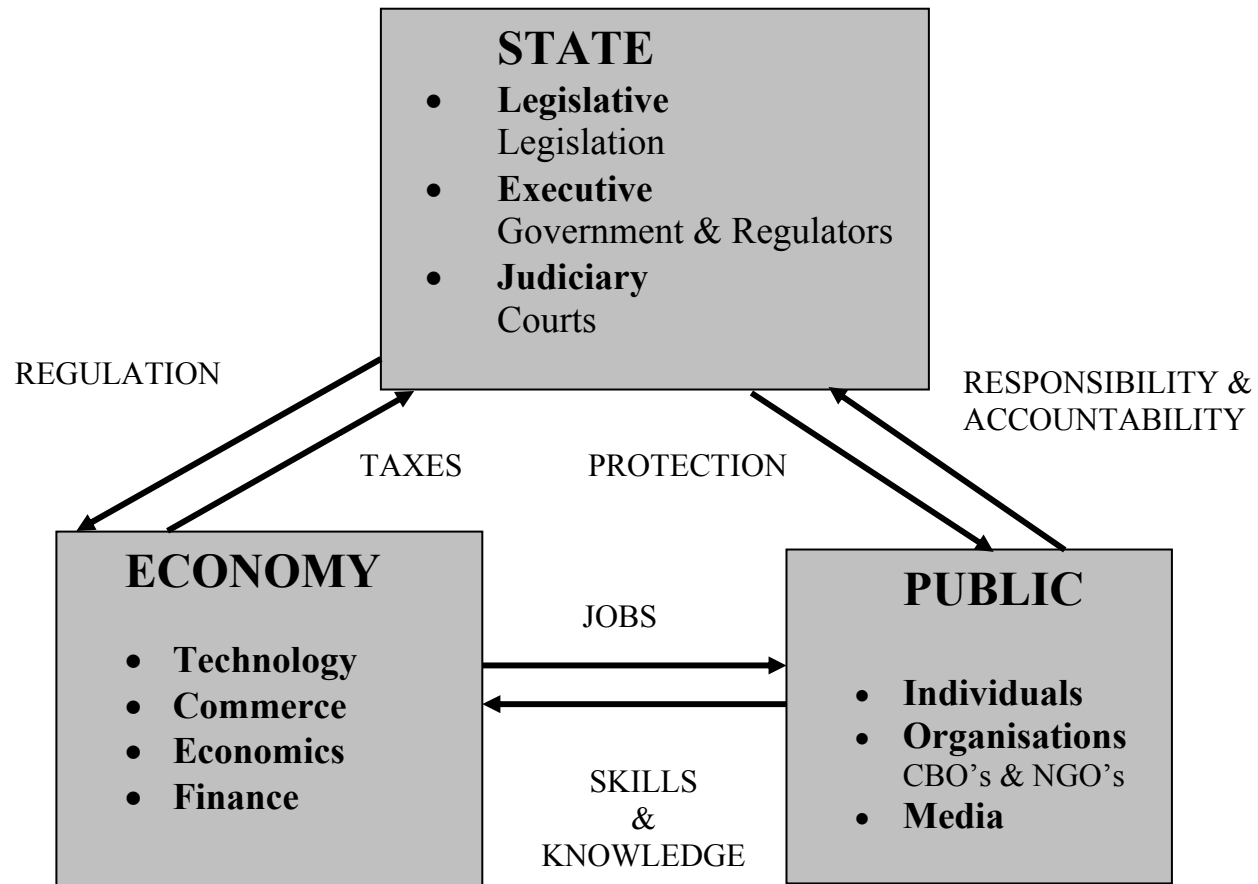


Fig. 1 The national system

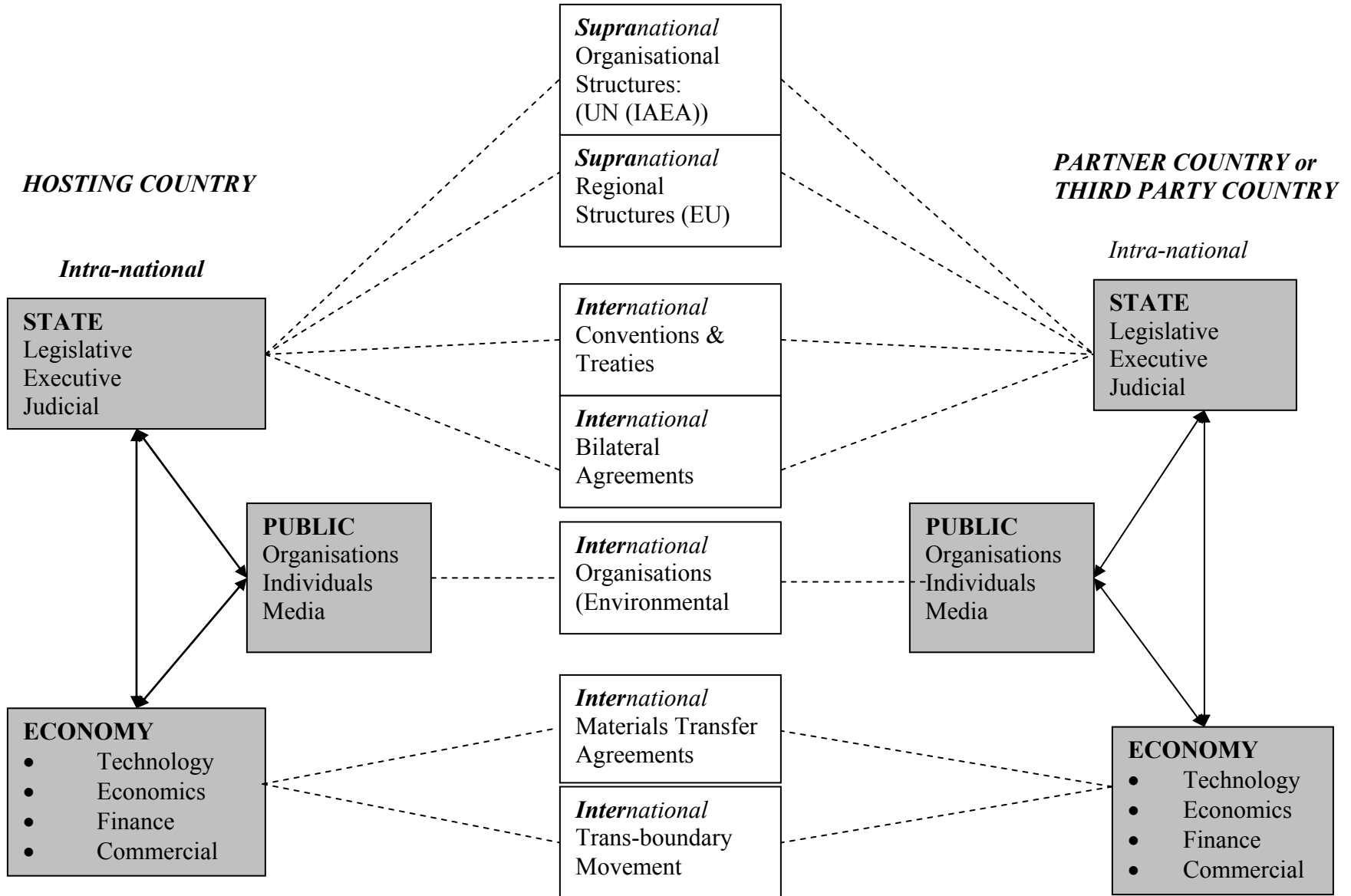


Fig. 2 A multinational national disposal system

Developing countries wishing to host a multinational scheme may not have a sufficiently well-developed legal framework for accommodating enabling legislation. In these cases assistance needs to be provided by partner countries and others to support the necessary legal process in a potential host country. Of particular importance is the need to ensure that the process is carried out in a transparent manner to ensure durability over the lengthy time frames applying to such projects.

The Role of Government

Governments of the hosting and partner countries need to make provision for the implementation of a multinational repository in their respective national radioactive waste management policies and strategies. The latter typically cover matters such as the overall coordination of the national radioactive waste management programme, the physical security of nuclear installations and the application of IAEA safeguards regime. It is foreseen that the governments of hosting, partner as well as third-party countries would play a vital role in the negotiations aimed at establishing the future multinational project. In developing countries, national radioactive waste management policies and strategies may lack the required level of sophistication - if such policies and strategies exist at all - for an undertaking of this magnitude. Gaining public consent for the acceptance of foreign radioactive waste may pose significant challenges to governments in developing countries. It is, however, possible that full public participation may not be a requirement in many developing countries. Whether or not this is acceptable to the partner and third party countries would depend on the circumstances. Generally speaking, it may be argued that the hosting country should be “politically stable”. But the question is clearly what constitutes political stability – does it relate to time scale, nature of governmental structures, social factors, etc.? And if so what would be good enough?

The Role of the Regulators

Regulators generally function as an extension of the executive arm of government and perform their functions within the confines of the respective national legislative framework. Nuclear and environmental regulations are separated in many countries. The regulatory framework in a country usually reflects the level of sophistication of its nuclear industry. Developing countries - usually with small nuclear program – tend to lack regulatory sophistication. Significant improvements to the regulatory regime in developing countries that desire to act as hosting countries may be required to enable adequate control over a multinational waste disposal system.

The Role of the Judiciary

In view of the political sensitivity of a multinational repository various interested and affected parties can be expected to seek legal redress for instance as a consequence of repository siting initiatives in the hosting country. Hence, litigation is considered an inevitable consequence of the implementation of a multinational system. It is considered essential that aggrieved parties should have free access to a fair judicial system. The extent to which this may be possible in many developing countries is debatable.

Public Participation

Socio-political considerations are of great importance for the implementation of a multinational system. In many countries public participation is legally required by the environmental and licensing processes for nuclear installations. Public participation thus needs to conform to specific institutional requirements based on prescribed procedures for ensuring transparency. Although public perceptions of the nuclear industry vary from country to country, much research has been done internationally to develop generic models for achieving public transparency in nuclear and related projects. One such example is the so-called RISCUM model [4] currently being used in the EU for evaluating public acceptance of nuclear and other issues in European countries. Over and above their national activities many NGO's (notably environmental groups) also operate actively within an international networking system. Public participation in national issues would depend largely on the extent to which public liberties are guaranteed by the socio-political system. It is debatable whether the socio-political systems in many

developing countries are strong enough to sustain a constructive and transparent public debate on the issue of multinational disposal. Although autocratic political decision-making processes tend to facilitate a more expeditious approach this may not necessarily be acceptable to responsible partner and third party countries.

Inter-national Requirements

With reference to Figure 2, the most important interactive processes taking place between participating countries in a multinational repository scheme are briefly discussed below:

International Conventions and Treaties

Prospective participating countries need to be signatories to important international conventions and treaties in order to provide to the global community assurance of future compliance with internationally recognized norms and standards in radioactive waste management. In this regard, compliance with the requirements of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management [15] is considered to be a prerequisite for countries wishing to participate in a multinational venture. Other conventions that apply, inter alia, are the Convention on Nuclear Safety, the Convention on Nuclear Liability and the Bamako Convention. The latter Convention was introduced by African countries to prohibit the import into Africa of hazardous waste, including nuclear waste, from the developed world. The Convention also prohibits the transboundary movement of radioactive waste between African countries themselves. Although this Convention has not been ratified by all African countries it nevertheless reflects existing African sensitivities to the issue of foreign radioactive waste acceptance.

Bilateral Agreements

Prospective participating countries need to enter into bilateral negotiations to define the conditions for radioactive waste transfer from partner to hosting country. These conditions will form the basis of subsequent commercial arrangements governing the implementation of the multinational repository scheme. A typical case in point is the transfer of ownership of spent nuclear fuel. In this regard there are several possibilities: (a) transfer of ownership may either coincide with the transport of the materials to the host country or (b) transfer may be postponed until repository closure, or (c) transfer may be deferred further into the future should the host and partners decide on some form of shared liabilities extending into the future. Another issue of importance is consent rights: For example, the US has consent rights on approximately 90% of the world's inventory of spent nuclear fuel and this constraint implies that spent fuel can be transferred only with the explicit agreement of the US, a matter that needs to be resolved by way of bilateral arrangements [2]. Any country transferring radioactive waste to another (e.g. a developing country) needs to ensure that the necessary infrastructure for the safe management of the waste exists within the accepting country before shipment takes place. This principle is also embodied in the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. Where the existing infrastructure is inadequate an upgrading programme needs to be established to provide the required level of waste management capability.

Multinational Organizational Structures

The hosting and partner countries need to set up appropriate organisational structures in their respective countries to implement multinational repository operation. These organisations may have an institutional and/or private character, as the case may be, depending on the extent of government involvement in the multinational repository enterprise. These organizations will be responsible for negotiating the waste transfer agreements covering the future transboundary movement of the radioactive waste. The logistics involved in the transportation of waste materials over long distances may pose a challenge, although there is already much experience in international transport of radioactive materials. The majority multinational collaboration on technical, economic, commercial and financial matters would typically be handled by

these organizations. Mechanisms need to be developed for managing the accumulated funds contributed by partner countries toward the final disposal of the delivered wastes in the hosting country. International guarantees may be required for the management of these funds over the lengthy duration of the scheme. In many developing countries the multinational organizational structures required to support a multinational waste disposal system may either not exist at all or lack the necessary guarantees. The organizational development needed to integrate existing domestic institutions into a larger multinational disposal system may constitute a significant challenge to these countries.

Supranational Requirements

With reference to Figure 2, the following relevant supranational structures can be identified:

Supranational Organisations

The United Nations Organisation is the most prominent *supranational* structure, comprising inter alia the International Atomic Energy Agency (IAEA). The latter organization primarily focuses on non-proliferation, safety and technical matters on behalf of its member states. There are cases where member states approached the IAEA for information and advice on aspects relating to the multinational repositories. This organization, as well as others such as the OECD (NEA), has the necessary credibility and capability to evaluate the feasibility of multinational systems [1,2,5]. Individual authors and working groups have already carried out investigations to determine the viability of multinational concepts [6,7]. Likewise, papers have also been presented at various international conferences on this subject [8,9,10,11,12,13,14].

Regional Structures

Where the participating countries form part of a *supranational* regional structure, such as the European Union (EU), the latter needs to play a leading role in the process of establishing the multinational disposal scheme.

Ethical Requirements

Notwithstanding the specific requirements mentioned above, internationally acknowledged principles embodied in charters, conventions, treaties, etc. need to be respected. These principles are to a large extent captured by the IAEA safety fundamentals, which serve as a useful set of values defining the obligations of radioactive waste generators and operators. The principles that are particularly relevant here are, inter alia, the protection of human health and the environment, the protection beyond national borders, the protection of future generations and the burden on future generations all of which imply an ethical obligation [16]. Ethical considerations are of great importance to the successful implementation of the multinational system. The considerations serving as drivers for the multinational concept are basically *utilitarian* in the sense that the concept ought to be working for the “greater good” of the international community. However, it is also vitally important that multinational programmes should not violate the rights of interested and affected parties such as countries, groups or even individuals. Therefore, by implication, these ethical considerations (utilitarianism versus rights-based approaches) should be carefully balanced to ensure the establishment of an equitable overall system.

The ethical principles involved in an arrangement in which developing countries accept radioactive waste from developed countries needs to be addressed. Considerations such as intra- and intergenerational equity involved in these multinational arrangements need to be taken into account. The balance of benefits and burdens for the hosting country in the short, medium and long-term would be decisive in judging the ethical justification of a multinational disposal system. The principal ethical question is whether or not such a multinational undertaking by a hosting country, as a developing country, would be fair and sustainable in the long run.

IMPLEMENTATION SCENARIOS

Multinational repositories for radioactive waste and spent fuel have not yet been developed by any group of countries worldwide. Thus practical experience in the area currently is limited and it is difficult to judge which conditions might be most suitable for developing and implementing multinational repositories. Consequently scenarios for establishing such repositories will depend significantly on the specific circumstances obtaining in potential hosting countries and these circumstances may change with time. It is, however, feasible to propose scenarios that could credibly lead to the development of multinational repositories. The three main scenarios below are classified according to the degree of self-sufficiency and independence of the repository in the host country [2].

Scenario 1

Extended National Repository:

This scenario assumes that a national repository programme is first developed and implemented in the hosting country and at a later stage disposal services are offered to potential partner countries. This implies that the hosting country has the political will, the technical and financial resources and natural conditions to develop a repository. In practice, in this scenario, the repository remains effectively a national repository, but with a part of the waste inventory coming from abroad.

Scenario 2

Multinational Repository Cooperation

This scenario implies that a group of countries pool their resources in order to establish a single multinational repository in one of the countries. There are three obvious options: (1) Several industrialized countries with relatively small nuclear energy programmes decide to cooperate for the disposal of their radioactive waste in a host country satisfying all necessary technical requirements; (2) Countries with small nuclear energy programmes in varying stages of development seek assistance from each other and cooperate to ensure that one of them acquires all necessary technology and institutional structures. Developing countries would typically fall into this category and (3) Specialization of repositories for specific types of waste combined with arrangements for international exchanges.

Scenario 3

Supra National Repository

This scenario assumes that the host country would effectively cede control of the land necessary for repository siting to an international body. This scenario seems unlikely in the foreseeable future; as such transfer of sovereignty is likely to be of extreme political sensitivity.

BENEFITS AND CHALLENGES [2]

Physical Security and Environmental Safety

For many countries with small nuclear programmes it may never be feasible to construct a repository of any type, which means that nuclear waste materials would remain indefinitely in surface storage. From a security and environmental safety point of view such countries would definitely benefit from multinational repository services should they be available. Compared with surface storage, disposal of nuclear materials provides a higher level of security due to the lower accessibility of the waste materials. Likewise, environmental protection would also be advanced where radioactive wastes are permanently isolated from the biosphere. On the other hand, multinational repositories may also increase some security risks as the larger concentrated volumes of nuclear materials may attract subversive attacks. It is debatable whether a multinational disposal system hosted by a developing country would readily be

considered - from a global political point of view - to be secure enough for providing physical protection of high level radioactive waste including spent fuel. In this regard the issue of “political stability” is, however, the term is understood may be relevant.

Economics and Finance

The technical requirements of a multinational repository are identical to those of a national one and the same technical principles need to be followed in designing the facility. A large capacity, multinational repository could offer an economic advantage in that the host and partners would achieve substantial economies of scale by pooling resources and sharing the costs as well as the associated financial risks. In this manner the host and partner countries could achieve a lower unit cost of disposal than would otherwise be the case for a national programme. Developing a multinational repository is, however, a decades-long undertaking, which poses a long-term economic risk from the point of view of political changes and dramatic increases in disposal costs. Developing countries may experience difficulties in providing the required assurance to its partners, as well as to third parties, that stability would be maintained within the overall multinational system. In particular, aspects such as the technical, economic and financial requirements need to be satisfied during the exceptionally long period involved in the construction, operation and closure of the multinational disposal system.

Legal and Institutional Issues

There may be an institutional challenge involved in maintaining the required multinational structures for the long operating life of the multinational repository. Such structures require a durability extending beyond the life of the typical critical institutions in the host and partner countries. Developing countries offering a multinational waste disposal service may not have an existing institutional base to support such an ambitious enterprise. Where the appropriate institutions in developing countries lack the necessary capability, these institutions would have to be upgraded to meet the challenges of multinational disposal system implementation. In general, developing countries may simply not be considered politically stable enough to act as hosting countries in a multinational context. The risk of a hosting country unilaterally terminating a multinational project at any stage in the future may pose serious difficulties to participating countries whose waste programs are linked to this scheme.

Socio-cultural Issues

A sufficient level of public acceptance in both the host and partner countries is necessary for the long-term success of a multinational repository project. History clearly shows that public acceptance of nuclear projects is difficult to achieve, especially projects involving disposal. Undoubtedly, public acceptance within the country proposing to host a multinational repository will face the most significant challenge. Once accepted, continuity of political and public support during the lifetime of a multinational repository project would remain critical. Political support for a multinational venture is important, not only for the host and partner countries but also for third-party countries. Gaining a broadly based level of public acceptance for a potentially controversial issue, such as a multinational disposal, may pose a significant challenge to many developing countries that have not yet acquired the capacity for managing public participation processes. The transparency requirements of such processes are particularly difficult to satisfy in the case of societal systems lacking a solid democratic base.

CONCLUSIONS

The institutional framework proposed in this paper appears to satisfy all the essential requirements and conditions for successfully establishing a multinational repository. This framework is defined essentially in terms of technical efficiency, societal legitimacy and stakeholder trust. In general terms, the implementation of multinational repositories would undoubtedly be a challenging but potentially feasible project. Multinational repositories can enhance global safety and security by making disposal options available to a wider range of countries. The benefits of multinational repositories can be large, and if

equitably shared between all parties they may outweigh potential drawbacks. Multinational repositories are not a substitute for national repositories, but rather a compliment to such national facilities. Multinational repositories can clearly offer a more economic solution to the disposal of radioactive waste in countries with small waste inventories.

In the context of developing countries the potential benefits of a multinational disposal system would be significant, although the challenges may be equally taxing. It is not suggested that the challenges are insurmountable, but rather that they need to be realistically addressed at an early stage of a project to ensure compliance with all the institutional requirements of multinational systems.

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