Guidelines for Risk incorporation into Spatial Planning and Environmental Assessment

Institutional building for natural disaster risk reduction (DRR) in Georgia

a MATRA project implemented by

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Risk Management, Spatial Planning and Environmental Management

1. Introduction

1.1. The chapters 1, 2 and 3 of the Guidelines deals with Risk Management, Spatial Planning and Environmental Management. A separate section will deal with the technical parts of Risk Assessment to Geological and Hydro-meteorological Hazards.

1.2. Section 1 describes how the risks from natural hazards (particularly flooding and mass movement) are being and could be dealt with in Georgia from a **Risk Management** perspective. This perspective focuses on approaches that have as their prime objective the reduction of natural risks and on the information required from hazard and risk assessment. The main addressees of this section are the organizations responsible for formulating risk management plans (among others: the National Environmental Agency (NEA) of the Ministry of Environmental Protection, Ministry of Regional development and Infrastructure, Emergency Management Department (EMD) of the Ministry of Interior, etc).

1.3. Section 2 gives attention to how to deal with risks from a **Spatial Planning** point of view. The chapter explains how hazard and risk considerations can be incorporated into spatial plans and into sectoral plans. Although formally spatial planning in Georgia is (still) almost non-existent, spatial planning and spatial planning measures are a potential to deal with risks in a more effective and comprehensive manner. Besides sectoral agencies with a strong spatial dimension (e.g transport, infrastructure, energy, agriculture) have also the potential to incorporate risk elements into their plans and projects. The main addressees of this section are the authorities at the various administrative levels (country, region, city/district, and commune/village) who potentially have a competence in spatial planning, as well as the authorities who are responsible for the sectors with a strong spatial component.

1.4. Section 3 of these guidelines will exclusively deal with **Environmental Assessment** and how natural hazards and risks can be integrated into processes of Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA).

1.4.1. The main addressees of this section are the actors with a significant role in commissioning, conducting and reviewing EIAs, i.e. proponents of projects, NGOs, consultants, independent experts and the Service of Licenses and Permits within the Ministry of Energy and Natural Resources.

1.4.2. The main addressees regarding the SEA processes are those actors involved in the development of strategic plans and programmes in the risk management sector and the ones developing strategic spatial and sectoral plans at the various administrative levels.

1.5. The rationale for having these three separate sections in the Guidelines is related with the different target groups and perspectives of how to deal with risks. However these sections should not be dealt as three mutually exclusive parts. The three

sections are complementary, sometimes partially overlapping and clearly connected. Cross references will be made throughout the document.

1.6. Figure 1.1. below is meant to position Risk Management (section 2) in relation to Spatial Planning (section 3) and the role of Environmental Management, i.e. EIA and SEA (section 4) in this perspective.

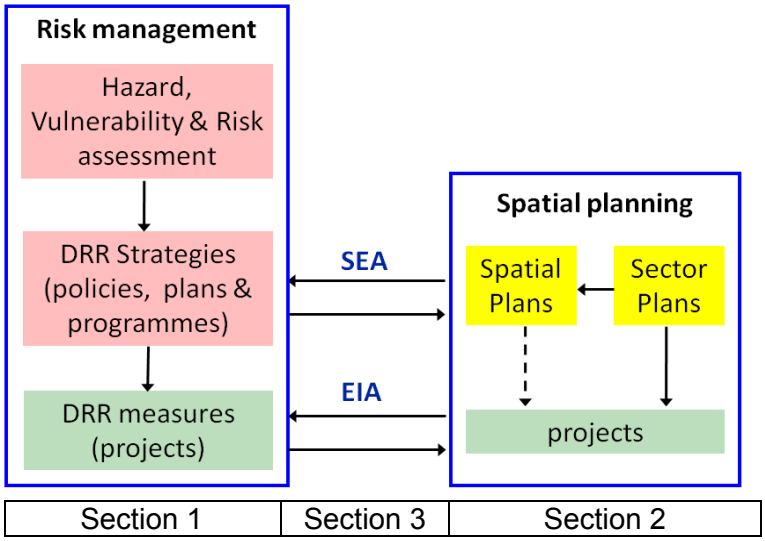

Figure 1.1. Relationship between Risk Management, Spatial Planning and Environmental Management.

1.7. The right part of the figure on Spatial Planning refers to spatial plans as well as to sector plans. 'Spatial planning' is usually defined (see e.g. Armonia project: Greiving et al., 2005) as a comprehensive, coordinating spatially-oriented planning on various spatial scales; whereas 'sector planning' is the planning for a specific sector. Plans for a number of sectors (e.g. transport, agriculture, infrastructure) have a relative strong spatial dimension and are therefore considered also part of spatial planning. The hazard and risk dimension might also be different for the different sectoral plans. Spatial planning as such has the aim to bring the different sectoral plans together for the spatial level concerned (for e.g. the region). In these Guidelines we have combined the spatial plans (so-called facet planning) and the sector plans together under the heading of spatial planning. Section 2 will describe how hazard and risk considerations can be incorporated into spatial plans and into sectoral (spatial) plans.

1.8. As illustrated in the above figure, Risk Management is clearly distinguished from Spatial Planning. This situation (i.e. a clear separation between the sectoral risk management sector versus the spatial planning authorities) can be found in many countries; (see for the European regions for example Greiving and Fleischhauer, 2006). However clear links exist between Risk Management and Spatial Planning. EIA and SEA are ways to further strengthen these links as also depicted in.

1.9. In Table 1.1 a number of differences between Risk Management and Spatial Planning, in terms of both spatial plans as well as sectoral plans, are given. Differences are given in terms of objectives, focus, institutional setup etc. Risk Management can be clearly distinguished from Spatial Planning. Risk and hazard assessment can be considered as an integral part of Risk management, while the direct role of risk and hazard assessment is less in spatial planning. Risk Management and Spatial Planning come closely together if spatial planning

instruments are being applied in a risk management strategy (chapter 1); and if risk considerations are being integrated into the spatial planning process (chapter 2).

	Risk Management (RM)	**Spatial Planning (SP)**	
		Spatial Plans	Sectoral Plans
Hazards	Single hazard oriented	Multiple hazards	Multiple hazards
Objective	Risk reduction	Multiple (economic, social, environmental)/sustainable development	Sectoral Development
Focus	A specific hazard	Administrative unit (country; regions/ Autonomous republics/Cities and Districts/Municipalities)	The relevant sector with a strong spatial dimension e.g. (transport, infrastructure, agriculture)
Spatial scale	Flooding: catchment area Land slides: geological units/local administrative area	Various depending on the administrative unit concerned	National, regional, local
Institutional responsibility	Sectoral agency dealing with specific natural phenomena and risks (e.g. water board; geological survey; environmental agency) – risk management agencies	Planning agency (multi-sectoral) – formal planning system	Sector planning agency
Relationship between RM and SP	Spatial planning is one of the potential instruments in Risk Management	Risk is one of the multiple concerns in Spatial Plans	Risk could be a condition or concern in in Sectoral Plans
Hazard assessment	Actively involved and integral part of RM	SP is end-user	SP is end-user
Risk assessment	Actively involved and integral part of RM	SP is end-user	SP is end-user
Risk management		SP is directly involved	Directly involved
Responsible agencies in Georgian context[1]	• NEA (landslides, flooding) • Ministry of Interior (response)…. • Local authorities • Other agencies with a prime responsibility for the management of specific hazards and risks	• Ministry of Regional Development and Infrastructure • Regions and autonomous republics • City and District governments/authorities • Local level management (villages, communities and towns)	• Ministry Economic Affairs • Ministry of Environmental Protection and Natural Resources • Ministry of Transport • Ministry of Energy • Ministry of Agriculture

Table 1.1 . Differences between Risk Management and Spatial Planning (spatial plans and sectoral plans)

[1] Presently no ministry nor local authority has an explicit task for spatial planning. Under Spatial Planning the (sectoral) ministries, agencies and local government levels involved in development activities with a strong spatial dimension are listed.

2. Risk Management Plans and Strategies

2.1. The main single objective in Risk Management approaches is the reduction of risk. A number of different approaches and measures can applied to reduce risks. Focus in these guidelines is on the reduction of risks from flooding and mass movements.

2.2. Risk management plans are to be developed for those areas where potential significant risks exist or could be expected in the future.

2.3. Potential risks now or in the future are to be identified based on a preliminary risk assessment.

Flooding

2.4. For flooding this means that Risk Management plans need to be developed for those river basins, sub-basins, catchment areas or coastlines with a potential risk for flooding now or in the future.

2.5. The areas with significant flooding risk are to be mapped in terms of the probability of floods (low, medium, high), providing information on flood extent, depth and velocity and the potential for loss.

Mass movements

2.6. Land slides management plans need to be developed for those areas with a potential for land slides or mass movements now or in the future.

2.7. The areas with significant land slides risk are to be mapped at local/regional level in terms of the probability, extent and the potential for loss.

2.8. The outcome of the EPSON hazards project (Schmidt-Thomé, 2006) could be used as a basis for outlining the typical steps to deal with risks at the regional and local/municipal level

Risk assessment – the scientific basis		
	Region	**Municipality**
Hazard identification	Inform the relevant stakeholders and the municipalities within the region about the nature and extent of natural and technological hazards (mainly "source of the hazard", "area affected") Provide a basis for policies, goals, objectives and measures to minimize future losses from the effects of hazards on the regional and local level Identify cumulative and trans-boundary Effects	Inform the relevant stakeholders within the municipality about the nature and extent of natural and technological hazards (mainly "threat to life and safety" and "property damage") Identify cumulative and trans-boundary Effects
Risk analysis	Identification of spatial risk by calculating hazard frequency of occurrence and vulnerability scores: combine the hazards map and the vulnerability map to produce the overall regional risk analysis	*Local risk analysis*: carried out like the regional risk analysis but in more detail, especially concerning the vulnerability (spatial hazards are geographically specific , this probability of occurrence has to be assigned to a specific area or hazardzone) Integration in the SEA process
Risk evaluation and risk assessment	Participation process to evaluate risk by taking the aspect of risk perception into account (on the regional level mainly experts from spatial and sectoral planning divisions) Weighting / identification of the relevance of risks on the regional level (e. g. by means of Delphi method)	Participation process to evaluate risk by taking the aspect of risk perception into account (on the local level the public but also experts from spatial and sectoral planning divisions) Make use hazard analysis made by sectoral planning divisions

		Weighting / identification of the relevance of risks on the local level (by use of micro-scaled methods that counter damage potentials on real estate level

Risk management – political decisions		
	Region	**Municipality**
Risk related planning goals and measures	Set up of planning goals and objectives (may already have been resolved in previous efforts that resulted in other local plans; positive goal statements provide people more incentives to work on the mitigation plan than do negative statements about the community) Select appropriate instruments and measures for the local level Reach consensus among all relevant actors (municipalities, sectoral planning divisions, certain private stakeholders like companies) Set up regional mitigation plan	Responsible for the selection of appropriate measures and their implementation which aim to fulfill the fixed goals because of detailed knowledge about the local situation (hazard as well as vulnerability related issues) and the responsibility for ϑ\appropriate instruments (local land-use planning, building permission etc.) Select appropriate instruments and measures for the local level. A collection of possible measures can be used as a checklist to ensure that every possible measure will be considered. Integration of land-use oriented measures in the legally binding land-use plans Integration of building protection measures in the building permission Set up local mitigation plan
Coordination between spatial planning authorities and sectoral planning divisions	Coordinate activities of sectoral and comprehensive planning; Install a regional data pool, containing relevant hazard and vulnerability data (NB. the gathering of data, their verification and interpretation will only be possible if spatial planning authorities as well as sectoral planning divisions work hand in hand on this topic – this has to be coordinated among the different institutions)	Coordinate activities of sectoral and comprehensive planning; Many of the databases used for identifying hazards and vulnerabilities need additional verification especially at the local level Use of existing local data pools (e.g. land-use, land register, environment etc.)

Risk management – implementation decisions		
	Region	**Municipality**
Involvement of public and private stakeholders in the implementation process	Draft regional mitigation plan made available for review by the residents and businesses who will be affected, appropriate municipal departments, interested organizations, state and federal agencies and neighboring municipalities. Distribute responsibilities for fulfilling of goals and objectives to persons and institutions.	Selection of measures made under involvement and based on a good information policy for the residents and businesses who will be affected, appropriate municipal departments, interested organizations and neighboring municipalities Distribute responsibilities for the implementation of measures to persons and institutions
Financing	Guarantee funding of regional mitigation plan and other instruments	Guarantee funding of local mitigation plan and other instruments
Monitoring and evaluation of implementation process	Plan should have a formal process to measure progress, assess how things are proceeding and recommend needed changes: monitoring system helps ensure that people remember their assignments and project timelines to reach goals and objectives Even with full implementation, the plan should be evaluated in light of progress and changed conditions	Monitoring system helps ensure that people remember their assignments and project timelines when implementing measures Even with full implementation, the measures should be evaluated in light of progress and changed conditions

Table 2.1 . Risk assessment and management at regional and municipal level (adopted from Schmidt-Thomé, 2006)

2.9. Risk management strategies are classified in various ways. One way is to distinguish Risk management strategies in the following 4 types of strategies (see also figure 2.1).

i. Prevention
ii. Preparedness
iii. Response
iv. Recovery

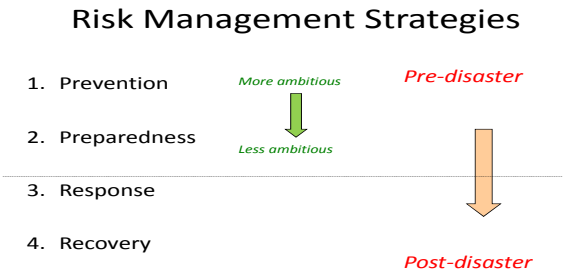

Figure 2.1.. Different Risk management Strategies

2.10. Risk prevention and risk preparedness are strategies being mainly applied before the possible event (pre-disaster), while response and recovery are strategies being applied in the case of an event (post-disaster). Risk prevention and preparedness strategies are usually aimed at long-term actions; while response and recovery strategies are mainly aimed at short-term (re-)actions (see table 2.2)

Prevention	Long-term actions
Preparedness (incl. monitoring	
Response	Short-term actions
Recovery	

Table 2.2 Long and short term Risk management Strategies

2.11. The guidelines are mainly focused on prevention actions, including mitigation actions. Mitigation actions can be considered as less ambitious prevention actions. Preparedness can be considered as even less ambitious, in the sense that these actions mainly prepare for response and recovery.

2.12. If the classical equation of risk is being applied; i.e. risk is a function of hazard, vulnerability and coping capacity. This means that risk can be reduced by:

i. reducing the hazard
ii. reducing the vulnerability of the elements at risk
iii. reducing the amount of the elements at risk; and/or
iv. increasing the coping capacity

2.13. These guidelines focus on risk reduction. In addition to risk reduction, risk can be transferred (risk transfer). Risk transfer is a measure by which non-affected population of a country assists the affected people with risk finance by way of insurance or catastrophe fund.

Risk reducing measures and policy instruments

2.14. Measures and policy instruments are the actual 'tools' by which risk can be reduced (categorization and terminology mainly adopted from Floodsite, 2009). Measures are the physical interventions in the environment. Policy instruments don't

intervene directly in the physical environment but are rather aimed at changing the behavior of the stakeholders who influence the risk. Policy instruments are also applied to complement and support the implementation of the (physical) risk reducing measures. Often it is impossible to implement measures without proper application of policy instruments.

Risk reducing measures	• Structural • Non-structural
Policy instruments	• Incentive instruments • Communicative instruments • Regulatory instruments • Direct government intervention

Table 2.3 Risk Reducing Measures vs. Policy instruments

2.15. Traditionally measures include the so-called **structural measures**. These types of measures include the engineering type of measures and construction of hazard-resistant and protective structures and infrastructures. Structural measures could aim at controlling or reducing the hazard as well as reducing the vulnerability of the area or elements at risk.

2.16. Although non-structural measures, as structural measures, also imply physical interference in the environment, they don't involve building (large) engineering structures. **Non-structural risk reducing measures** are the measures aimed at modifying the susceptibility of hazard damage and disruption and/or the impact of hazards on individuals and the community. These measures are sometimes called 'soft' measures and focus on modifying the conditions of the source area or the area at risk. Over the last decades these non-structural measures have gained importance among others due higher cost-effectiveness. The distinction between structural and non-structural measures is not very crisp. In addition, often a combination of structural measures and non-structural measures is being applied. Therefore these guidelines won't apply a very strict distinction between structural and non-structural measures.

2.17. The risk management authorities are often, although not exclusively, the responsible agencies to implement (structural and non-structural) risk reducing measures.

2.18. Action by the risk management authorities alone is mostly not sufficient to be effective in risk reduction. Influencing the behavior of the private sector (industries, construction companies), civil society, communities, property owners and individuals is indispensable to make the implementation of (structural and non-structural) risk reducing measures successful. For the latter policy instruments are required.

2.19. **Policy instruments** are usually distinguished into incentive, regulatory and communicative instruments.

- Incentive instruments may encourage or discourage households and enterprises to build on certain locations or to build in a certain manner (e.g. to stimulate certain type of building)
- Communicative instruments contribute to increased awareness about potential risks
- Regulatory instruments allow or forbid certain activities (land use regulations) In addition governments might intervene directly to reduce the future risk.

2.20. Examples of (potential) measures and policy instruments for flooding as well as for land slides, which are relevant and applicable in the Georgian context are given in Annex Ia. and Ib.

Assessment of risk reduction measures and policy instruments

2.21. Risk reducing measures and policy instruments are to be evaluated against a number of criteria (economic, technical, social, financial and environmental criteria) to allow making a proper and informed decision about which measure and/or instrument to apply. In the final choice of measures and instruments a choice will be often based on the weight placed on safety and risk by the decision makers.

2.22. There are a number of tools that can be used in evaluating the best scenarios for disaster risk reduction:

- Cost Benefit Analysis (CBA) is used to compare costs and benefits of a one specific measures or a set of alternative measures over a period of time. CBA assesses the measure(s) mainly on the basis of the efficiency criterion. It requires the monetization of all the effects. The effects that cannot be expressed in monetary terms will be usually described in their original unit of measurement.
- Cost Effectiveness Analysis: (CEA) has most of the features of CBA, but does not require the monetization of either the benefits or the costs (usually the benefits). CEA does not show whether the benefits outweigh the costs, but shows which alternative has the lowest costs (with the same level of benefits). CEA is often applied when the norm for a certain level of safety has been set. CEA analyzes which types of solution is the 'cheapest' given a certain level of safety standard.
- Multi Criteria Analysis (MCE) is a tool that allows comparing alternative measures on multiple criteria. In contrast to CBA, MCE allows the treatment of more than one criterion and does not require the monetization of all the impacts. MCE results in a ranking of alternatives.

Cost Benefit Analysis (CBA)

2.23. Safety can always be increased but this will always be at a higher costs. Besides absolute safety can never be achieved. Cost-benefit asks the question if the intended (additional) costs of risk reducing measures are outweighed by the (additional) benefits, mostly in terms of reduced risk (i.e. increased avoided damage) and enhanced economic opportunities. In theory, CBA could answer the question what is the optimal size of the investment in risk reducing measures, i.e. where are the additional costs of the investment larger than the additional expected benefits.

2.24. Detailed handbooks are available for CBA (e.g. Boardman, 2006). However applying CBA to risk reducing measures, involve some special dimensions. Cost Benefit Analysis (CBA) of risk reducing measures requires estimates of the costs and the benefits of the measures.

2.25. Below a general overview is given on how risk and hazard considerations can be integrated into the economic analysis of a project (ProVention Consortium, 2007b).

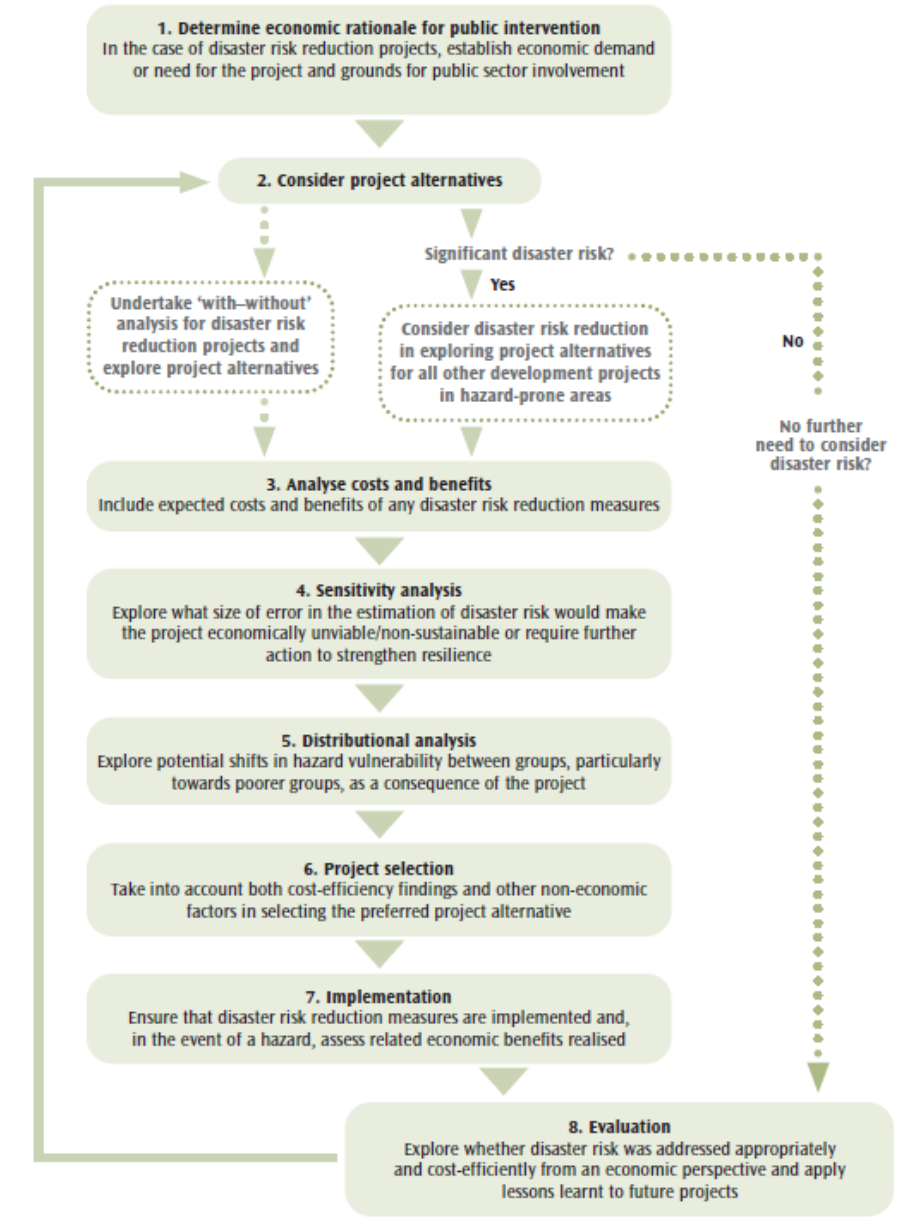

Figure 2.2. Integration of disaster risk concerns into economic appraisal (ProVention Consortium, 2007b).

2.26. Below some specific characteristics are given for the assessment of risk reducing measures.

2.27. The **costs** of risk reducing measures include the costs of:

- The investment costs of the measures
- The costs of maintaining the risk reducing measure
- Costs are specified for each year over the life time of the risk reducing measure
- Costs are usually given in constant prices

2.28. The estimation of the **benefits** is usually the most difficult and challenging, particularly for risk reducing measures. In general, the benefit of risk reducing measures consists mainly of the 'decreased expected damage'.

2.29. Although in data-scarce environments it might be impossible to give a full comprehensive overview of the **decreased expected damage**, it is suggested to identify at least the most obvious types of damage that will be avoided by implementing the risk reducing measure. A distinction can be made between the direct and indirect damage and between the tangible and intangible damage (for the case of flooding see Figure 2.3).

		Measurement	
		Tangible	**Intangible**
Form of damage	**Direct**	Physical damage to assets: - buildings - contents - infrastructure	- Loss of life - health effects - Loss of ecological goods
	Indirect	- Loss of industrial production - Traffic disruption - emergency costs	- Inconvenience of post-flood recovery - Increased vulnerability of survivors

Adapted from: Penning-Rowsell et al. 2003; Smith & Ward 1998

Figure 2.3. Types of flooding damage: direct and indirect; and tangible and intangible (Floodsite, 2007)

2.30. The damage that can be quantified in monetary terms could be used as an input into the CBA. To calculate the decreased expected damage, the analyst needs to estimate the difference between the expected damage with the risk reducing measures and without. Various approaches are available to arrive at these damage estimations. Type of approaches will depend on the (see for flooding: Floodsite, 2007):

- Spatial scale
- Objective of the study
- Available resources/time
- Pre-existing data

Typical data that are required to calculate the expected damage of flooding risk include (see figure 2.4):

- Inundation characteristics with and without the risk reducing measure
- Land use data
- Value of the assets at risk (per land use category)
- Damage functions

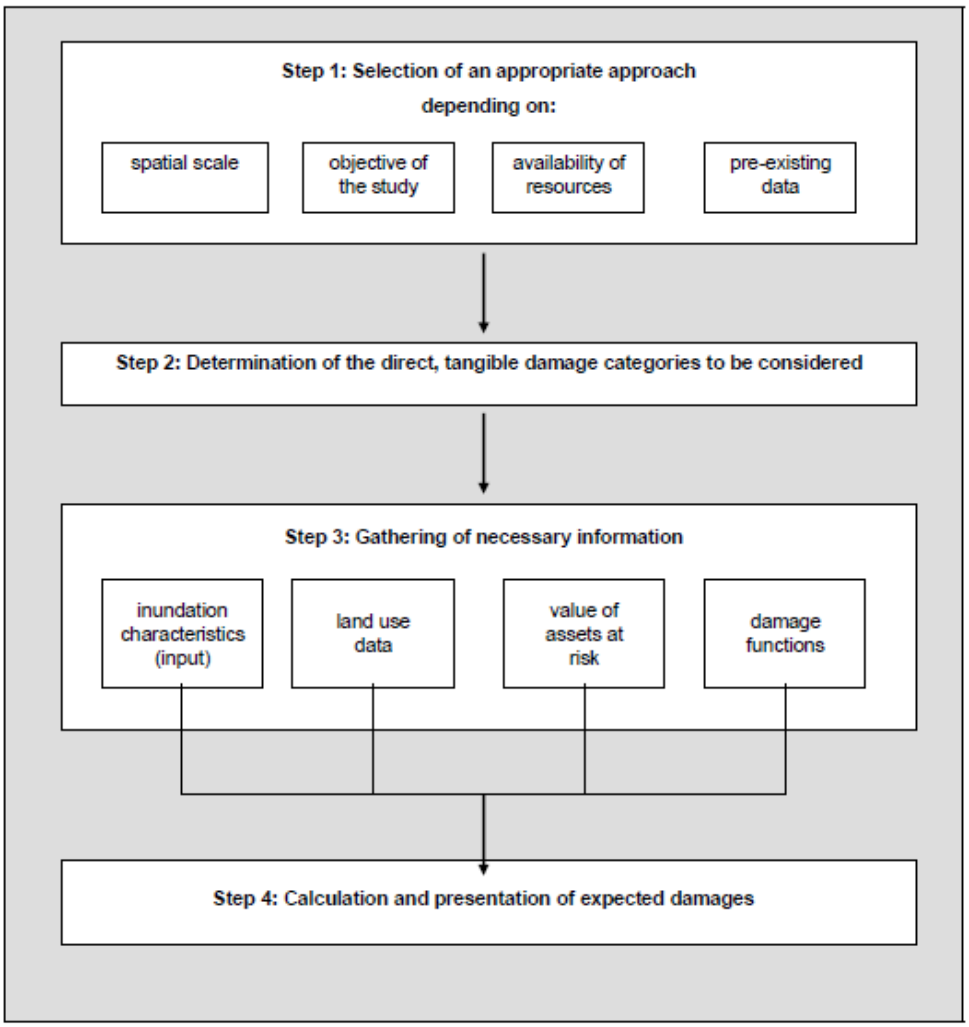

Figure 2.4. Approaches and data required for flooding damage calculation (Floodsite, 2007)

2.31. In CBA the annual costs and benefits are discounted to arrive at a final estimate of the so-called net present value. If the net present value is positive the project is (theoretically) feasible from an economic point of view (for example see Annex II).

2.32. The general stages for estimating costs and benefits for (flood) risk reducing measures are outlined in Figure 2.5.

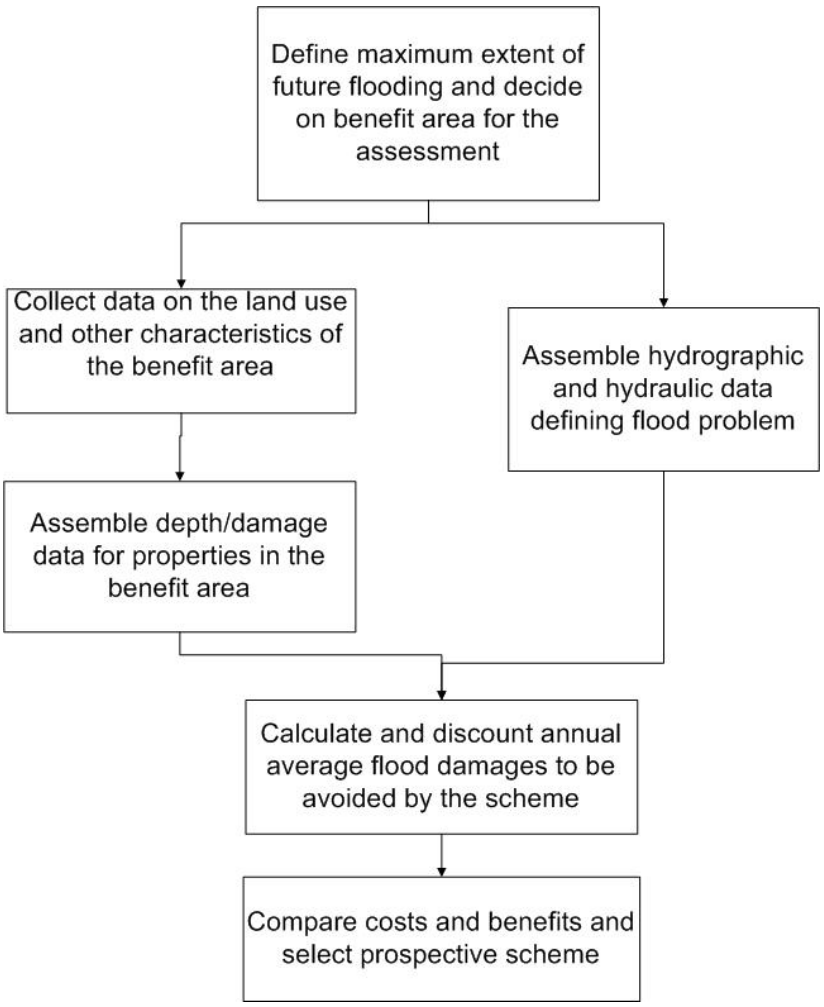

Figure 2.5. Stages for estimating costs and benefits for (flood) risk reducing measures (Floodsite, 2007)

2.33. Caution needs to be taken in interpreting the results:

- Estimated parameters have a high degree of uncertainty (values of objects at risk, probabilities of the hazard with and without the application of the measure)
- Damage functions are difficult to construct, often based on a (too) low number of observations
- A number of damage categories are not taken into consideration (social, environmental damage, indirect damage)
- At least a sensitivity analysis need to be conducted based on the highly uncertain parameters; still caution needs to be taken for all the assumptions made in the preceding analytical steps

2.34. A minimum that could be done to start drawing up an inventory of the losses due to particular hazards (historical damage assessment databases)

2.35. Traditionally, cost-benefit analysis (CBA) is one of the tools used in policy making to prioritise the allocation of public spending. Cost-benefit analysis (CBA) is well established particularly for measures for flood risk reduction. However, a concern is that CBA does not take into consideration a number of damage categories and others social and environmental factors.

2.36. Cost Effectiveness Analysis (CEA) and Multi Criteria Analysis (MCA) approaches are considered as alternative or at least complementary methods to

assess and evaluate risk reducing measures. Unlike CEA and MCA, CBA has the capacity to determine the optimal scale of the policy or project.

Cost Effectiveness Analysis (CEA)

2.37. Cost-effectiveness analysis (CEA) is a method to assess which risk reduction measure meets a specified norm or target at the lowest cost. Practical advantage of CEA over CBA is that benefits do not need to be specified in monetary terms. Particularly if certain risk levels are specified (possibly with the input of a CBA type of analysis), CEA is a useful tool. If a certain safety level has been determined (e.g. a risk occurrence with a 1:2,500 year interval recurrence interval) and a choice has to be made among alternative feasible risk reduction measures, CEA helps to select the measure with the lowest cost.

2.38. Usually cost-effectiveness ratios (CERs) are calculated for each alternative. A CER corresponds to the costs of the risk reduction measure to obtain a single unit of effect. The latter can be a norm or a unit of the risk reducing effect, e.g. number of reduced damaged properties, reduced number of fatalities, reduced number of people to be evacuated.

2.39. In measuring, valuing and aggregating the costs, CEA makes use of discounting and present values in the same manner as CBA.

2.40. CEA compares alternative risk reducing measures and leads to a ranking, but without the assurance that any one of them is actually worth doing. For the latter it is necessary to be able to compare benefits and costs in such a manner that enables to conclude if benefits are larger than the costs, which requires expressing benefits and costs both in monetary terms (i.e CBA).

2.41. A crucial issue in CEA is the selection of the effectiveness measure. In practice, indicators of effectiveness are often chosen by experts. As trade-offs could exist between certain effectiveness measures (e.g. one alternative might lead to a relative high reduction of fatalities and a relative low reduction of the number of damaged properties as compared to an alternative risk reducing measure), the choice for different effectiveness measures will lead to different rankings of alternatives.

Multi Criteria Analysis (MCA)

2.42. Multi-criteria analysis is a whole range of methods that allow ranking different alternatives (e.g. risk reducing measures) according to a number of criteria. Common elements in MCA are a set of discrete alternatives that are assessed on the basis of a set of criteria.

2.43. Criteria can be expressed in their own dimension and measured in quantitative or qualitative terms. In contrast to CBA, the effects don't need to be expressed in monetary terms.

2.44. To allow aggregation of the different effects, the measurements need to be standardized and the criteria be weighted according to their respective importance. The MCA will result in a ranking of alternatives according to the aggregated utility.

2.45. The typical steps of MCA in the evaluation of alternative (risk reducing) measures are:

i. Definition of the decision problem (usually a ranking of alternative measures)
ii. Definition of discrete alternatives
iii. Identification, structuring and definition of the assessment criteria
iv. Scoring of the assessment criteria
v. Standardization of criteria scores (based on value or utility functions)
vi. Definition of the importance of the criteria through weighing of criteria
vii. Aggregation of standardized criteria scores with criteria weights
viii. Analysis of the robustness of the results for changes in scores, weight, value functions (sensitivity analysis)
ix. Final suggested ranking of alternative risk reducing measures

2.46. Two main areas where current practice of risk assessment is often deficient and MCA could play a role (Floodsite, 2007):

- Current practice of risk assessment and cost-benefit analysis still focuses on damages that can be easily measured in monetary terms. Social and environmental consequences are often neglected. Multi-criteria analysis allows the inclusion of social and environmental consequences without having to translate these in monetary terms.
- The spatial distribution of risks as well as of the benefits of risk reducing measures are rarely considered. Therefore, it is often unknown which areas benefit most from a measure and which areas do not. The spatial multi-criteria approaches show the spatial distribution of the different risk criteria.

2.47. An alternative to MCA are balanced-score cards, which are simple tables in which the quantitative and qualitative scores of a limited number of indicators are simple listed and ranked, without any further standardization and aggregation.

2.48. Main advantages of MCA over CBA include the inclusion of multiple criteria, including the ones that are not easily incorporated into a CBA (environmental effects; distributional effects), and the higher potential for the involvement of stakeholders in defining the alternatives, criteria and weightings.

2.49. Spatial MCA can also be utilized in differentiating areas with different degrees of risks and vulnerability, which could be the basis to apply spatial risk mitigation measures (see section 3).

3. Spatial Planning and hazard and risk considerations

3.1. Spatial Planning (general/concept) and its relation to Risk management

- Spatial planning.
    - Spatial planning is concerned with the problem of coordination or integration of the spatial dimension of different sectoral policies at a specific spatial administrative level (national, regional or local).
    - This implies that spatial planning per definition addresses multiple objectives, (i.e. economic, social and environmental) and is multi-sectoral
    - Spatial planning has the potential to contribute to the management of natural risks; however the role of risk management in spatial planning in general is minor (in ECE, 2008, about 20 economic, social and environmental benefits of spatial planning are listed of which "*addressing potential environmental risks (e.g. flooding, air quality*) is only one.
    - Regarding the treatment of hazards spatial planning will have to deal with multiple hazards; however spatial planning is not directly involved in Risk Assessment. Spatial planning should be considered as an end-user of hazard assessment information.

3.2. (Potential) Spatial planning structure in Georgia

- National level.
- Regions and autonomous republics
- City and District level
- Local level (villages, communities and towns)

3.3. Contribution of spatial planning and spatial planning instruments to risk management

- *For each administrative level the relevant and typical spatial plans and spatial planning instruments with relevance for risk management will be outlined*
- *The typical risk and hazard information required for each spatial plan and spatial planning instrument will be outlined for each administrative level*

3.3.1. Regional Spatial Planning

- Regional plans have an indicative character and could be used to guarantee regional interests in the spatial development of the region (interests that go beyond the local level)
- Regional plans are developed to fulfill the task of setting the spatial or physical structure and development at regional level
- Regional plans are developed to integrate spatially the various sectoral plans at regional level, the spatial aims at the higher, and the specific interests and decisions on land use taken at the local level within the land-use planning of the municipalities
- The regional plan often has a strategic role and an indicative function for the lower authorities. The normative (binding) role of the regional plan varies per country.
- The scale at which regional plans usually are drawn is in the range of 1:50,000 to 1:100,000.

The spatial plan at regional level could fulfill a role in risk management in the following ways (see Greiving and Fleischhauer, 2006).

a. Major structural risk reducing measures

- In regional spatial plans sufficient space should be allowed for the construction and existence of structural risk reducing measures (i.e. usually large engineering works) and the required adjacent area. Information on the required space needs to be supplied by the sectoral agencies responsible for identifying and implementing risk reducing measures

b. Non-structural measures aimed at reducing the hazard impact

- Although non-structural measures aimed at reducing the potential of the hazard impact are the main responsibility of the sectoral agencies, regional plan could support these types of measures by appropriate designations in the regional plan aiming at binding effects regarding municipalities and other sectoral planning divisions; examples:
  - Protection of existing retention areas (to maintain protective features of the natural environment that absorb or reduce hazard impacts),
  - Extension of retention areas.
  - Prohibit major land uses that are conducive for certain hazards

c. Non-structural measures aimed at reducing damage potential

- Avoiding hazardous areas can be understood as the key task for spatial planning and especially the regional level. The most important element consists of settlement restrictions by means of so called “priority zones” due to the given damage potential within highly populated areas.
- The designation of priority zones allows regional planning to keep hazardous areas free of competing demands. With such stipulations, land-use decisions of the local level can be directly controlled by the regional level. By “reserve zones” it is possible to improve the awareness for appropriate judgement in local land-use decisions. Possibilities:
  - Risk priority zones: Exclusion of all uses, which are inconsistent with the priority function. Priority in these terms means that there is a land-use priority for a certain hazard – or in other words: because of the possible occurrence of (a) certain hazard(s), no other form of land-use will be allowed. This means a strict settlement prohibition in threatened areas, which is binding for local land-use planning as well as other planning divisions (e.g. transport planning etc.).
  - Risk reserve zones: Settlement restrictions, consideration of given threats through building protection or exclusion of especially threatened (e.g.schools, hospitals) and hazardous (e.g. chemical plants) facilities.

3.3.2. Local land use-planning

- Creation of policies at local/municipal level to guide land and resource uses inside the administrative borders of a municipality that is in charge of its task
- Main instrument are zoning or zoning ordinances
- Often two stages in local level land use planning
  - A general or preparatory land-use plan (scale 1:5,000-1:50,000) with a more indicative character
  - A detailed land use plan for the various areas of the municipality specifying the land use and/or type of construction. This plan is often

binding (scale 1:5,00-1:5,000) and could be used as a basis for building permissions

a. Major structural risk reducing measures

- Structural mitigation on a local level can be primarily understood as a task for building permissions aiming at special obligations in order to protect buildings or other facilities against potential hazard impacts (e.g. flooding, land slides).
- Building regulations often are under the responsibility of special state authorities. Local level land-use plan offer the possibility for the municipality to influence building permissions.
    - In the preparatory land-use plan potentially hazardous zones should be designated.
    - Based on this information, special obligations within a legally binding land-use plan could be integrated aiming at the protection of buildings, which might be developed within threatened areas.

b. Non-structural measures aimed at reducing the hazard impact

- Although the different sectoral planning divisions are the most important actors in this field, local land-use planning is able to support these actions. The more the impact can be limited to local areas the greater the potential influence of local activities is.
- For example, especially when regarding the contribution of settlement areas to the surface run-off, the support of local rain water infiltration activities has to be taken into consideration. In this way, local flash floods could be managed better by means of local activities, which are under the responsibility of the municipalities. Another possibility for local influence can be highlighted by the example of land slides. Local reforestation activities may help to avoid landslides.

c. Non-structural measures aimed at reducing damage potential

- Zoning instruments: Especially for the enforcement of restrictions of land use at the level of municipal land use planning **hazard maps** with a scale of about 1:2,000 – 1:10,000 are necessary. However, the following three types of zoning related instruments could be distinguished to improve the application of non-structural measures:
    - Co-ordinated zoning in general land use plan
    - Specific hazard zones map in general land use plan with direct binding character
    - Independent map without a direct binding character to landowner
- Each of the three types of instruments with their respective advantages and disadvantages are described in Figure 3.1 below.
- *In the Georgian case it is suggested to follow an approach starting with independent hazard zone plan (column 3.) that gradually is 'upgraded' into specific hazard zones maps (column 2.) and finally fully integrated into the coordinated zoning in the land use plan (column 1.)*
- The hazard zone plan could be drawn up in first instance per type of hazard (flooding, landslides). Eventually a multi-hazard map could be developed; this should not be the priority as specific information per hazard might be lost and also in European countries the experience with multi-hazard maps used in spatial planning is very limited (see Greiving et al., 2005)

Possibilities of the presentation of natural hazards within a local land use plan, Source: Greiving and Fleischhauer, 2006), p.121 based on Böhm *et al.* 2002, p. 61

	1. Co-ordinated zoning in general land use plan	**2. Specific hazard zones map in general land use plan with direct binding character**	**3. Independent map without a direct binding character to landowners**
Description	Consideration of the hazard areas during the compiling or the review of the local land use plan by the suitable allocation of types of land use and intensity.	The hazard zones are displayed as a separate map, which has a direct effect on land ownership rights – property owners have the right to object to the hazard zone classification shown. (Hazard zones determine for the allowed land use).	Definition of hazard zones within the scope of expert planning („hazard zone plan") – objections may be raised to decisions that are made on the basis. (Hazard zones are meant as notification ; no binding character)
Advantages	At the local level, no new instruments are necessary.	The hazard can be considered in a uniform manner for the complete local planning area. The definitions of the hazard zones can be applied directly in building approval procedures.	A simple alteration of a hazard zone plan is possible. Restrictions can be made according to the latest information. The administrative expenditure is low. Suitable for a cooperative strategy aiming at influencing existing building structures by means of individual building protection.
Disadvantages	Land-use plans only contain information about hazard areas when a special reference is made to these. An alteration of the danger situation means that the zone plan must be adapted accordingly.	An alteration of the danger situation means that the complete zone plan has to be adapted accordingly. For legally binding effects a very carefully and exact mapping is needed.	No effectiveness in case of an unwillingness of private stakeholders to participate.

Figure 3.1 Comparison of three types of zoning related instruments

3.4. The spatial planning in sectoral plans

3.4.1. Although this part of the Guidelines focuses mainly on the spatial planning response by the spatial authorities, the important role in spatial planning of the different sectoral planning divisions cannot be neglected.

Prevention

3.4.2. Sectoral planning influences to a wide extent several driving forces behind for (meteorological) hazards. For example sectoral planning agencies are responsible for transport infrastructure, industrial facilities and the energy sectors which are the main causes of the emission of carbonic gases. In consequence, the main instruments for reducing these emissions are under control of sectoral planning. Under the prerequisite of a political willingness, the several sectoral planning divisions would be responsible for influencing emissions which might affect different environmental media (water, air, soil) by push and pull oriented instruments.

Mitigation

3.4.3. Specific sectoral planning authorities are normally responsible for agriculture and forestry. In this context, the water storage capacity of these areas should be highlighted. Adequate land cultivation could help to reduce the surface run-off as well as avalanche prone areas. Such kind of measure could be part of hazard protection plans, carried out by sectoral planning (e.g. flood action plan, coastal protection plans);

3.4.4. Spatial planning is a main responsible actor for reducing damage potential. However, in the context of special project approval procedures, which might be necessary for infrastructure projects, the relevant sectoral planning division is in charge of an adequate infrastructure design, location and protection (housing, transport infrastructure, social services).

3.5. The spatial planning process and risk considerations

- In developing spatial plans at regional level (regional plan) and local level (general or preparatory land-use plan and the detailed land use plan) it is suggested to follow SEA-type of procedures, in which risk and hazard considerations are integrated (see chapter 4)

4. SEA and EIA for Risk Management and Spatial Planning.

4.1. Natural hazard assessment and risk management is a process of identifying and evaluating the adverse risks associated with natural hazards and developing strategies to manage it. Natural hazards are an integral component of the environment. Natural hazard and risk management is significantly different from traditional preparedness and response activities.

4.2. The latter often concentrates on individual hazard events, addressing existing problems, while risk management focuses more on anticipating problems by ensuring that growth and development address the likelihood of hazards and their interaction with environmental systems aiming to avoid and reduce vulnerability to these hazards across all sectors of society and the economy. Such an approach needs to become an integral part of planning and policy making.

Why Natural Hazard Impact Assessment (NHIA)?

4.3. Many countries and development agencies do not consider hazard and disaster risk in development planning and lack sufficient strategies to plan, assess, prevent or mitigate the effects produced by these events.

4.4. There have been several initiatives to identify tools to aid in the implementation of the Hyogo Framework for Action (HFA) and to aid in mainstreaming Disaster Risk Reduction (DRR) in development cooperation.

4.5. Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA) are decision-making tools for mainstreaming hazard and DRR in policies, plans, programs and projects at national, regional, local and sector levels. Traditionally however, EIAs have focused on the impact of the project on the environment, with less attention to the impacts of natural hazards on the project. In a hazard-prone country such as Georgia, it is essential that the interactions between the proposed development and natural hazards are explicitly investigated and incorporated into the EIA and maybe future SEA process, hence Natural Hazard Impact Assessment (NHIA).

Natural Hazard Impact Assessment (NHIA)

4.6. While the assessment of natural hazard impacts is well established, NHIA is a relatively new term. NHIA is defined as (after CDB, 2004): “a study undertaken to identify, predict and evaluate natural hazard impacts associated with a new development or the extension of an existing facility. This is achieved through an assessment of impact of the proposed development on increased vulnerability to natural hazards and an assessment of the project’s vulnerability and risk of loss from natural hazards. An NHIA is an integral component of environmental impact assessment in that it encourages explicit consideration and mitigation of natural hazard risk.”

4.7. The objectives of this section of the guidelines on mainstreaming of NHIA in EIA and SEA are to:

- provide a mechanism for incorporating natural hazard and risk considerations into the planning and project cycle;
- promote hazard and risk avoidance, minimization and compensation through incorporation of hazard mitigation into the plan and project design; and

- enhance EIA and SEA practitioners' understanding to incorporate natural hazard and risk considerations in EIAs and SEAs, and
- illustrate hazard and DRR practitioners how SEA and EIA may provide a framework for strategic planning of vulnerability to disaster and of the potential impact of various activities on disaster vulnerability.

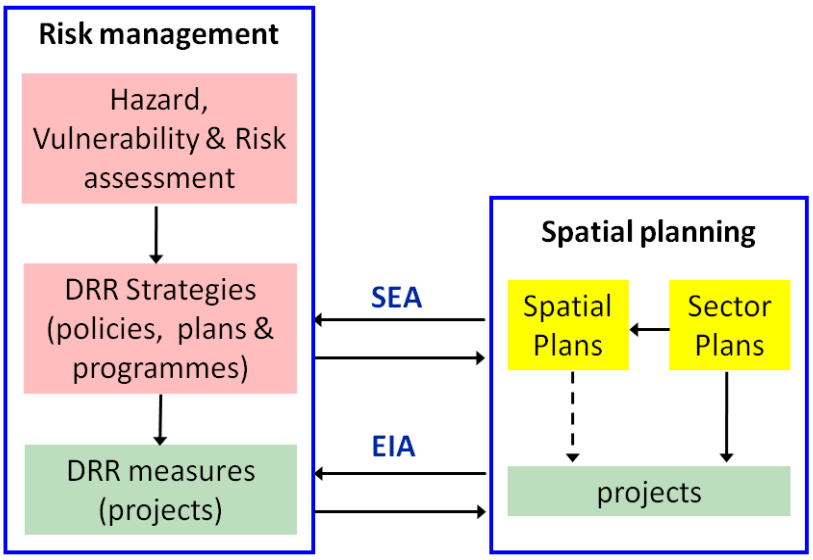

Figure 4.1 Integration of Hazard and Risk management in Environmental Assessment for Spatial Planning

The incorporation of natural hazards and disaster risk into the EIA process

4.8. Consideration of risk forms part of project evaluation through the project cycle, and vulnerability to specific hazards are essential to risk analysis in the context of project viability and sustainability. Mechanisms for improving project selection, siting, planning, design, and implementation in hazard vulnerable areas will be facilitated through the NHIA process. In addressing anticipated adverse impacts from natural hazards, the implementation of appropriate mitigation and adaptation planning and management mechanisms must be considered.

4.9. A key factor affecting public acceptability of and support for any proposed development is the level and nature of public consultation that has been undertaken and the amount of public input obtained in the project design. It is well understood that, to be effective, the EIA process should ensure transparency in all decision-making stages, provide timely, adequate and accurate information to the public and provide access to the public to all relevant documents that are not confidential. The same considerations also apply to NHIA-EIA.

4.10. The integration of natural hazard considerations in the EIA process is presented in Figure 4.2. The consideration of natural hazards does not require any structural change to the overall EIA process and creates only few additional requirements.

4.11. In the following sections a step-by-step description of the EIA process is provided. A short description is given of the natural hazard considerations and analyses to be addressed in each step of the generic EIA process, followed by the objective, information needs, process and responsibility for each step.

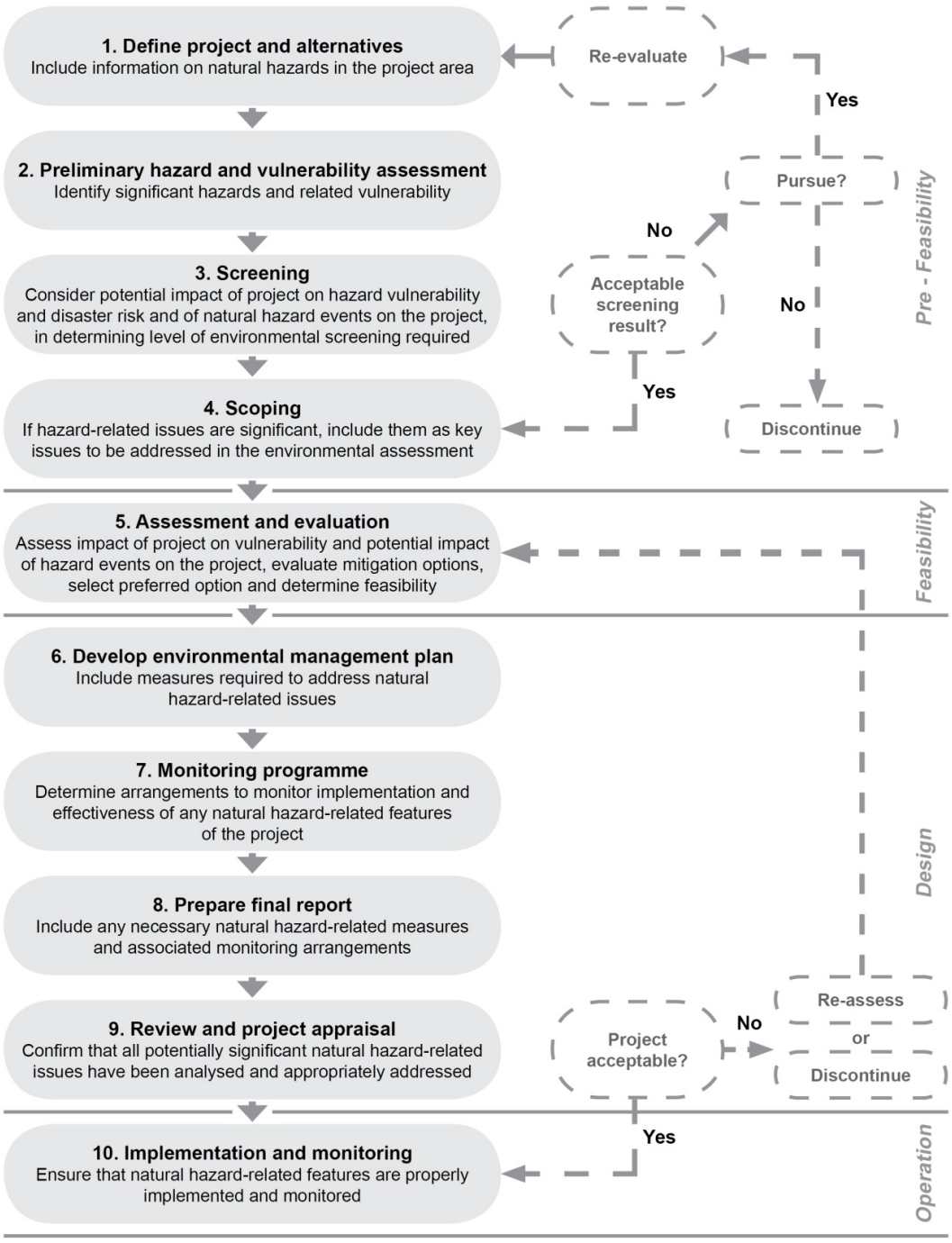

Figure : Integration of disaster risk concerns into environmental assessment. (Based on CDB and CARICOM, 2004 and Proventum Consortium, 2007)

Figure 4.2: Integration of disaster risk concepts into environmental assessment.

Step 1: Define Project and Alternatives

4.12. The initial project description should contain detailed information concerning the nature, scope, setting (legal, financial, institutional) and timing for the proposed project and related activities. It should identify environmental or social issues of concern, including any prevalent natural hazards that may affect the project or vice versa. It should also outline

Objective:

- Describe proposed project and alternatives
- Identify significant hazards and hazard impacts to inform EIA screening and scoping (Steps 3 and 4).

Information needs:

- Project information: plan(s), design(s), costs, expected benefits
- Project scope: spatial and temporal boundaries
- Site information: location, environment, prevalent hazards and vulnerability, development and social setting

Process:

Using existing information and expert knowledge, estimate frequency or probability of hazard events

Step 2: Preliminary hazard and vulnerability assessment (qualitative analysis)

4.13. The main natural hazard component in this step is to undertake a preliminary hazard and vulnerability assessment to identify and evaluate impacts of potential natural hazards impacts on the project's area of influence. This assessment should consider both vulnerability and, due to climate change, the frequency and intensity of hazard events over the life of the project, but in a qualitative way. During an EIA there is often no time to carry out a quantitative hazard, vulnerability and risk assessment. The purpose of this step is to gather sufficient information from existing sources and expert knowledge to inform the Screening and Scoping steps that follow.

4.14. The following questions should be considered during any preliminary hazard and vulnerability assessment undertaken during screening, and answered more fully during project preparation:

- What, if any, project elements are likely to be affected significantly by natural hazards?
- What, if any, project elements are likely to affect prevalent natural hazards?

4.15. The process for "Estimating Frequency or Probability of an Event" and "Estimating Severity of the Impacts"*, can be used to identify environmental, social and economic components at high risk to impacts from natural hazards that would require further analysis in the EIA. Hazards and impacts that are identified as low to medium risks would not need further assessment. A low-impact or low-frequency hazard or impact does not automatically mean that the hazard or impact will be classified as low risk. Both low-impact but frequently occurring hazards and low-frequency but high impact hazards can be costly and destructive.

Hazard	Very unlikely to happen	Occasional Occurrence	Moderately Frequent	Occurs Often	Virtually Certain to Occur
	Not likely to occur during the planning period	May occur sometime but not often during the planning period	Likely to occur at least once during the planning period	Likely to occur several times during the planning period	Happens often and will happen again during the planning period

Table 4-1: Estimating frequency or probability of an event

Impact	Social issues			Economic issues			Environmental issues		
Degree	Displacement	Health	Loss of livelihood	Property loss	Financial loss	GDP impact	Air	Water	Ecosystems
Very low									
Low									
Moderate									
Major									
Extreme									

Table 4-2: Impact rating matrix

Step 3: Screening

4.16. The EIA Administrator (with the project proponent's concurrence) determines whether an EIA is required and, if so, the level of impact assessment that must be undertaken. Based on the potential environmental impacts and natural hazard risks associated with the project one of the following EIA categories is assigned to the project.

Objective: Determine, based on information provided, whether a) the project is likely to have a significant effect on the environment and b) natural hazards are likely to have significant effects on the project, and therefore require further study.
• **Information needs:** Initial project description and output of initial vulnerability assessment.
• **Process:** Using information from initial hazard and vulnerability assessment, assign appropriate category based on frequency, probability and severity of impacts.
• **Responsibility:** Competent authority/Reviewing agency.

Box... Screening categories
• *Category A (Full EIA Report) for significant impacts:*
A proposed project is classified as Category A if their impacts are highly likely to contribute to increased vulnerability to natural hazards. Projects should also be assigned to Category A if the anticipated short-term to mid-term impacts from natural hazards are highly likely to result in significant adverse environmental, social and/or economic impacts. These impacts may affect an area broader than the sites or facilities subject to physical works.
• *Category B (Focus EIA Report) for limited impacts:*
A proposed project is classified as Category B if its potential adverse environmental impacts on human populations or environmentally important areas are present, but less adverse than those of Category A projects. Projects should also be assigned to Category B if the anticipated short-term to mid-term impacts from natural hazards are likely to result in social, economic, structural or environmental impacts, but ones that are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases natural hazard mitigation and climate change adaptation measures can be designed more readily than for Category A projects.
• *Category C for minimal or no impacts:* A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impacts, or minimal anticipated short, medium or long-term impacts from natural hazards. In such circumstances a detailed EIA report is seldom required.

Step 4: Scoping (Category A and Category B projects)

4.17. The purpose of the scoping step is to agree on the issues, including natural hazard related ones, to be investigated in the EIA and on the scope of work (or terms of reference) to carry out those investigations. The terms of reference then serve as the roadmap for the actual work on the EIA and determine the resources and expertise required to undertake it. A sample terms of reference with natural hazard considerations included is presented in Annex Section 4.0.

4.18. If disaster risks are significant or the proposed project is likely to have a significant impact on vulnerability to natural hazards (i.e., Category A or B projects), these topics should be included in the list of issues for investigation and relevant expertise built into the assessment team. Further information and any related analysis required to carry out the EIA and to provide baseline data for subsequent monitoring and evaluation should then be identified. Information needs include baseline hazard data on the project site, information on significant hazards and their potential impacts on the project, appropriate management, mitigation (prevent, minimize or compensate) and adaptation mechanisms, and relevant legislation and institutions.

Objectives: Identify and agree upon the critical issues to be addressed in the EIA and the information and analyses required for inclusion in the environmental assessment report to determine acceptability and feasibility of the project.

Information needs:

- Baseline data on project site, existing detailed hazard maps and assessments
- Significant hazards and potential impacts on or by the project and zone of influence/ project boundaries identified in screening
- Relevant legislation and institutions.
- Climate change assessments

Process:

- Identify information needs regarding significant hazards and vulnerabilities.
- Specify analyses that must be conducted to complete project assessment.
- Agree on the terms of reference/scope of work for the impact assessment (including stakeholder involvement).

Responsibility: Proponent; advice from independent EA Commission/Agency

In Annex: Refer to TOR, Annex 4, pp 122-124.

Step 5: Assessment and Evaluation (Category A and Category B projects)

4.19. Guided by the TOR established in the scoping, the next step is to undertake the assessment, produce the EIA report and review the EIA report. The hazard based assessment includes the following iterative activities:

1. Establish baseline.
2. Predict impacts.
3. Evaluate management, mitigation and adaptation options.
4. Select preferred alternative.
5. Determine feasibility

4.20. The main purpose of this step is to consider the potential effects of the project (during construction, operation and, if relevant, decommissioning) on the frequency, intensity and consequences of significant natural hazards and the impact of these hazards, in turn, on the project. This assessment will help to determine if each of these effects is acceptable, extending the preliminary hazard and vulnerability assessment conducted in Step 2 both for Category A and B projects. If potential effects are not acceptable, appropriate management, mitigation and adaptation options must be identified to bring them into an acceptable range.

4.21. The baseline and vulnerability information is used to determine if the potential impacts of the project and of natural hazards on the project are acceptable. Where these impacts are determined to be unacceptable, management, mitigation and adaptation options must be identified to bring the impacts into an acceptable range. A preferred alternative, with the necessary management, mitigation and adaptation options included, can then be selected and its feasibility determined. While presented as a linear process, the components of this step comprise an iterative

process and may be revisited multiple times before arriving at an acceptable preferred alternative.

4.22. Consultation with stakeholders should also cover information on natural hazards and related vulnerability. Vulnerability can be highly localised and it is, therefore, essential to seek the views of the local community. Perceptions of risk can also influence behaviour, again making it important to consult different stakeholders.

Objective: Fully assess and characterise significant natural hazards, their potential impact on the project and potential effects on those hazards introduced by the project.
Information needs:
- Baseline data
- Hazard studies and maps indicating past incidence
- Factors influencing hazard occurrence
- Climate change scenarios

Process:
1. Establish baseline.
2. Predict impacts.
3. Evaluate management, mitigation and adaptation options.
4. Select preferred alternative.
5. Determine feasibility

Responsibility: Proponent to undertake assessment, including a detailed hazard, vulnerability and risk assessment, using specialists (natural hazards, engineering, social), as appropriate.

Step 6: Develop Environmental Management and Monitoring Plan

4.23. Environmental management plans that are developed as part of the EIA process are usually not designed to address the impacts of natural hazards. The procedures for developing environmental management plans must be updated to incorporate disaster risk management, mitigation and adaptation options to address natural hazard related vulnerabilities and risks identified in step 5.

Objective: Develop management, mitigation and adaptation plans to address natural hazard vulnerabilities and risks identified and develop an appropriate monitoring programme.
Process:
- Environmental management plan developed that incorporates the management, mitigation and adaptation measures identified during assessment and evaluation (Step 5).
- Develop a Monitoring plan for natural hazard related issues during project implementation and operation

Responsibility: Proponent prepares environmental management and monitoring plan.

Step 7: Monitoring Programme

4.24. Within the context of natural hazards the monitoring programme should ensure the implementation and effectiveness" of the project's features related to disaster risk management and climate change adaptation, including monitoring of the impact of the project on vulnerability to natural hazards and the impact of any hazard events on the project. The monitoring programme should be incorporated into an enforceable monitoring agreement.

Step 8: Prepare Final Report

4.25. The final report will incorporate the findings of the hazard and vulnerability assessments and the management, mitigation, adaptation mechanisms necessary to address natural hazard vulnerabilities and risks identified, and ensure monitoring arrangements covering the implementation and effectiveness of these measures.

Objective: Produce an EIA report that incorporates the management, mitigation and adaptation measures necessary to address natural hazard vulnerabilities and risks identified and includes an appropriate monitoring programme for project implementation and impacts.
Process:
- Detailed EIA report with the results of the hazard and vulnerability assessments.
- Environmental management plan, which includes identified management, mitigation and adaptation measures, incorporated into the project plan.
- Monitoring programmes integrated into the project plan.

Responsibility: Proponent prepares the EIA report.

Step 9: Review and Project Appraisal (Review & Decision-making)

4.26. A project appraisal of the natural hazard components of an EIA must confirm that:

• all potentially significant hazards, as identified in step 4 (scoping), have been analyzed using appropriate methodologies;

• appropriate and sufficient management, mitigation and/or adaptation measures have been identified and incorporated into project design for all potentially significant impacts identified in the detailed hazard and vulnerability assessments (step 5); and

• it is technically, financially and administratively feasible to implement the necessary natural hazard risk management measures in the proposed project.

4.27. A sample project appraisal/review checklist that includes natural hazard considerations is included in Section 10 of the Annex (CDB report)

Objective: Determine viability and acceptability of proposed project against established criteria.
Process:
- Technical review by responsible authority against established criteria.
- Approval or rejection of project.

Responsibility: (Independent) Review Commission, Competent authority/Leading agency

Step 10: Implementation and Monitoring

4.28. The main purpose of the natural hazard component of this step is to ensure that the specified mitigation/adaptation and monitoring measures are implemented in the project and that the selected measures are appropriate.

4.29. The project proponent is responsible for ensuring that the project is developed in accordance with the provisions of the final Environmental Management and Monitoring Plan for the project, which includes the approved management, mitigation and adaptation measures to address natural hazard considerations.

4.30. The EIA Administrator ensures that regular reports are submitted by the project proponent outlining the results of any monitoring that has been undertaken. Lessons from project implementation and monitoring are to be captured to inform the design and implementation of similar projects in the future.

Objective: Ensure that the specified management, mitigation, adaptation and monitoring measures are implemented in the project and that the selected measures are appropriate.
Information needs:
Management, mitigation and adaptation programme.
Natural hazard and project monitoring information.
Process:
- Ensure that mitigation/adaptation measures are included in project design and (where applicable) loan terms.
- Monitor implementation of specified measures.
- Monitor effectiveness of specified measures during project implementation and operation.

Responsibility: Project proponent, Competent Authority.

The integration of natural hazards and disaster risk management into Strategic Environmental Assessment (SEA) for spatial planning

4.31. Like in EIA, SEA can be used to consider both i) how development objectives can be affected by disaster risk and ii) how a proposed development can influence the vulnerability of communities to disaster risk, but at the level of policies, plans and programmes.

4.32. Though SEA is not yet institutionalised in Georgia, this section of the guidelines will stress the importance to consider hazard and risk management at a higher, strategic level of planning, following the EU SEA Directive as a framework (ESPON, 2006).

4.33. The main purpose of SEA according to article 3 of the EU Directive 2001/42/EC is the 'assessment of the significant effects on the environment, including on issues such as biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage including architectural and archaeological heritage, landscape and the interrelationship between the above factors" (European Union 2001, Annex 1, Letter f).

4.34. Art. 5, paragraph 1 of the SEA directive prescribes that "an environmental report shall be prepared in which the likely significant effects on the environment of implementing the plan or programme, and reasonable alternatives taking into account the objectives and the geographical scope of the plan or programme, are identified, described and evaluated". This obligation respectively the identification, description and evaluation of significant effects can be described as similar to the usually practiced steps of hazard identification, risk analysis and risk evaluation as relevant parts of a risk assessment process (ESPON, 2006). Furthermore, risk management can be seen as a part of decision-making in the sense of Art. 8 of the SEA directive.

4.35. Annex II of the directive, which points out the characteristics of the effects and the area likely to be affected, indicates the following risk related aspects as relevant for the assessment of significant effects on the environment:
- the probability, duration, frequency and reversibility of the effects
- the cumulative nature of the effects,
- the risks to human health or the environment (e.g. due to accidents),
- the magnitude and spatial extent of the effects,
- the value and vulnerability of the area.

4.36. The integration of risk related requirements into the procedural regulations of SEA are summarized in table…. below (Source: Grieving, 2004, pg 14). The general requirements prescribed in the EU requirements are not restrictive and leave ample room for adaptation to suit each Member State.

4.37. In a hazard and risk inclusive SEA two planning approaches can be distinguished:

1. The integration of SEA into a disaster risk management plan
2. The incorporation of hazard and risk considerations into SEA for spatial or sector

Risk Assessment and Man-ageme nt Process	Corresponding procedural obligations of the SEA
Hazard Identification	Identification of significant effects on the environment (Art. 5 ,p. 1) Consultation of authorities (Art. 6, p. 3)
Risk Analysis	Description of significant effects on the environment (Art. 5 ,p. 1)
Risk Evaluation	Evaluation of significant effects on the environment (Art. 5, p. 1) Consultation of the public (Art. 6, p. 4)
Risk Assessment	Assessment of the significant effects (Art. 3)
Risk Management	Integration of environmental considerations into the plan or program (Art. 8, 9)
Planning of Measures	Reasonable Alternatives (Art. 5, p. 1) „Measures envisaged to reduce or eliminate such effects [on the environment]" (Art. 7, p. 2).
Monitoring	Monitor the significant environmental effects of the implementation of plans and programmes (Art. 10, p. 1)

Table 4-3: The integration of risk related requirements into the procedural regulations of SEA

plans/ programmes.

In spatial planning both approaches are related as was illustrated in Figure 4.1.

The integration of SEA into a disaster risk management plan

4.38. Figure 4.3.illustrates how SEA can be integrated into a disaster risk management plan Examples are the Lee Catchment Flood Risk Assessment and Management Plan in Ireland, and the Room for the River Plan in the Netherlands.

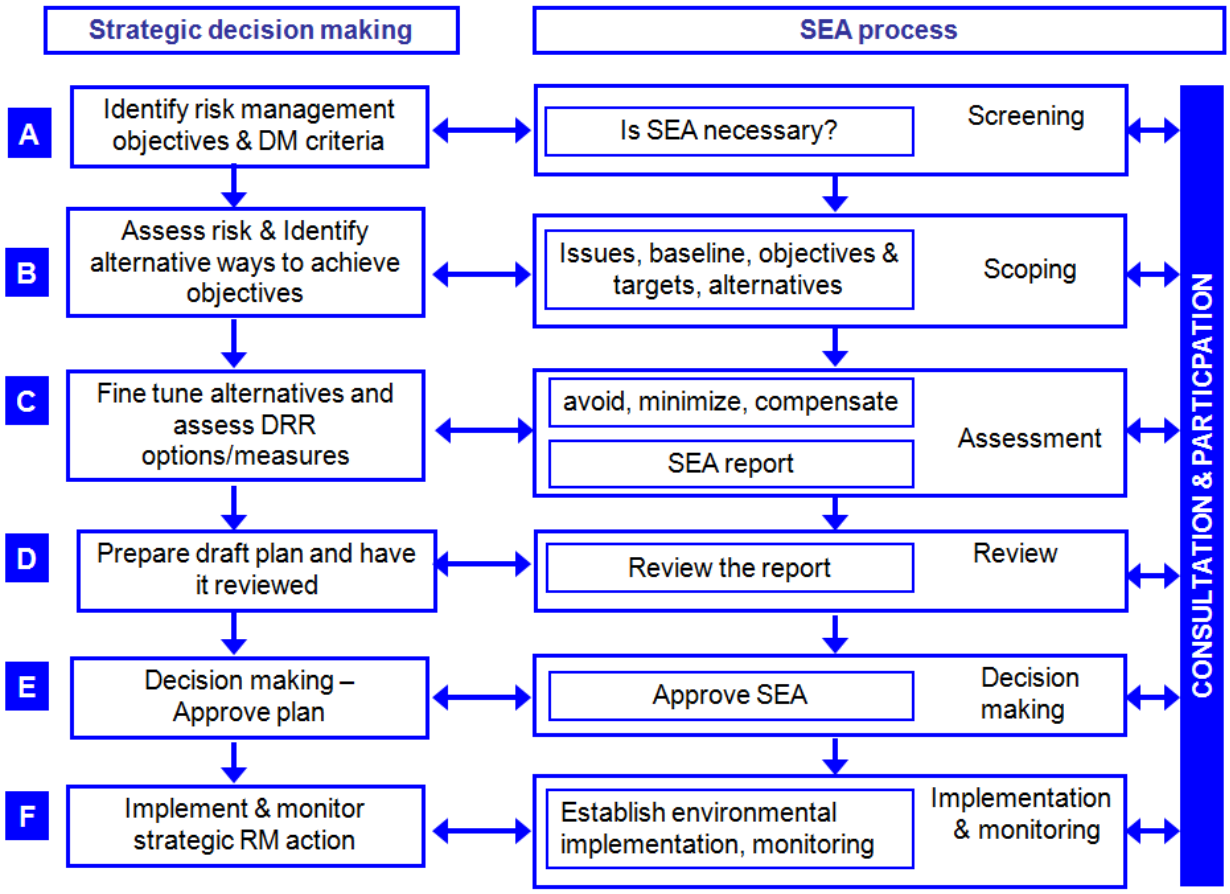

Figure 4.3: The integration of SEA into a disaster risk management plan (after: EC, Directorate-General for Energy and Transport, Brussels, 2005).

The incorporation of hazard and risk considerations into SEA for plans or programmes

4.39. SEA of national, regional and local area plans and programmes should include natural disaster risk(s) as one of the key issues (criteria) in the assessment process. Natural hazards and potential disaster risk(s) from all sources should be identified and considered at the earliest stage in the planning process and as part of an overall hierarchy of national responses coupled to regional appraisal and local and site-specific assessments of the disaster risk.

4.40. A sequential approach to planning is a key tool in ensuring that development, particularly new development, is first and foremost directed towards land that is at low risk of a natural hazard like e.g. flooding or earth quakes. The sequential approach for flooding and earth quakes should be applied to all stages of the planning process. It is of particular importance at the plan making stage but is also applicable in the layout and design of the proposed development within a specific site at the development management stage.

4.41. The key principles of a natural disaster risk-based sequential approach in (SEA for) spatial planning are:

- **Avoid** development in areas at risk of flooding and/or earth quakes;
- If this is not possible, consider substituting a land use that is less vulnerable to flooding and/or earth quakes.
- Only when both avoidance and **substitution** cannot take place should consideration be given to **mitigation and management** of risks**.**
- Inappropriate types of development that would create unacceptable risks from flooding and/or earth quakes should not be planned for or permitted.

- **Exceptions** to the restriction of development due to potential flood risks are provided for through the use of a **Justification Test**, where the planning need and the sustainable management of flood risk to an acceptable level must be demonstrated. Ensure emergency planning measures are in place.

4.42. The guidelines for incorporation of natural hazards and disaster risk in SEA for spatial planning follow the four main stages usually distinguished in SEA (OECD-DAC, 2008):

1. Establish the context
2. Implementing the SEA
3. Informing and influencing decision making
4. Monitoring and evaluation

4.43. Step/Stage 1: Establishing the Context:

- Identify, collect and assess available information on the natural and human hazards that affect the region concerned by the policy, plan or program as well as information on the vulnerability of regions, populations and sectors to those hazards.
- Identify measures and policies or policy reforms that currently address disaster risks in relevant sectors and government agencies;
- Determine whether other related development policies, plans and programs affect (increase or decrease) these risks and whether these linkages have been established and/or whether policy coordination and integration can contribute to reducing disaster risk.
- Identify stakeholders knowledgeable in disaster risk.
- Plan and organize consultations with stakeholders and groups particularly vulnerable to disaster risk, as well as with decision-makers, throughout the planning process of the strategic environmental assessment.
- Identify the need for institutional strengthening and capacity-building related to disaster risk assessment and risk reduction measures.

4.44. <u>Stage /Step 2 Implementing the SEA:</u>

- Determine whether the relevant stakeholders have all the information they need on disaster risks and risk reduction options to participate in a meaningful way and whether their views can be considered fully in the decision-making process.
- In collaboration with key stakeholders identify the key risks and vulnerability implications of the policy, plan or programme (PPP) under consideration and for alternative PPP options. Note that development policies and practices can affect exposure, hazard risk and underlying vulnerabilities. In defining these key risks and vulnerabilities ensure that the concerns and needs of the most vulnerable (i.e. women, poor, elderly and handicapped) have been considered.
- Determine whether there are adequate political, institutional and managerial mechanisms (including monitoring arrangements) for including disaster risk assessment and disaster risk reduction in the PPP and decision-making process?
- Assess whether the financial and human resources are sufficient to implement the activities identified as needed to ensure that risk reduction measures are considered and addressed.
- Identify measures for mitigating the impacts of natural hazards of the PPP and if necessary, related measures for climate change adaptation.
- Ensure that the SEA identifies the investments needed for dealing with disaster risks facing or resulting from the PPP in question.

4.45. <u>Step 3 Informing and Influencing Decision-Making:</u>

- Inform senior decision-makers on the main risk and vulnerability implications of the strategy, (PPP) under consideration and on the potential means to address these risks and vulnerabilities.

- Prompt lower-level decision-makers to examine risk reduction issues and to work cross-sectorally to identify risks and responses.

4.46. Stage/Step 4 Monitoring and evaluation:

- Assess whether on-going disaster risk and vulnerability monitoring or data collection activities have been identified and reviewed. Determine who is responsible for data collection and monitoring.
- Develop the strategy for reviewing, monitoring and evaluating disaster risk.
- Develop indicators and institutional capacity for carrying out monitoring and evaluation and determine how they will be used and tracked.

4.47. Although differences between SEA processes in the European Union may arise, the Directive nevertheless constitutes an important incentive toward the establishment of integrated SEA processes where the public plays a determining role in decision-making and where monitoring is used as a dynamic means for improving the environmental performance of plans and programmes.

4.48. A key element contributing to the quality and effectiveness of European EIA and SEA is the development of a spatial data infrastructure under the INSPIRE initiative. If the problems related to data availability and access of spatial information could be resolved, the time and costs for preparing impact assessment reports could be significantly reduced. This would contribute to better and more transparent planning and decision-making (Vanderhaegen and Muro, 2005, in ESPON, 2006, PG 146).

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Annex Ia.

Risk reducing measures and policy instruments – flooding[2]

Risk reducing measures		Relevant/responsible authority
Structural	- Construction of dams and reservoirs - Temporary storage of flood water, so-called flood retention basins - Construction of artificial levees to protect the land at the non-river side from flooding - Embankments and flood walls (with/without openings) - Channel improvements/ modifications - By-passes - Flood proofing of buildings - Large retenion areas	-
Non-structural	- Local, small scale retention in small catchments - 'Room for the rivers' measures - Local-small scale storage of water in urban areas - Reforestation - Dredging - Adapted agricultural practice	-
Policy instruments		
Incentive instruments	- Subsidies, loans and/or fiscal incentives for implementing risk reducing measures (land, buildings, building materials) - Penalties/fines for certain risk increasing behavior - Land and property taxation - Insurance and mortgage policies (to adhere to certain norms, codes and land use regulations, e.g. building in flood plains)	-
Communicative instruments	- Land slide/hazard mapping (e.g. web-based) - Local Community Development - Public awareness; Information and communication ➢ Public information ➢ Guides ➢ Campaigns ➢ Dissemination ➢ General education ➢ Radio or television broadcasts ➢ Use of printed media ➢ Information centres ➢ Networks and community and participation actions - Information and data sharing - Organisation and institutional building - Training (professional and academic) o Government Officials o Construction Specialists, engineers, builders, planners and architects o Land use planners o Tertiary Students o Building Maintenance Staff - Research (applied)	-
Regulatory instruments	- Zoning (macro; micro) - Protection measures - Controlling land use (intensity; seasonal) - Building restrictions - permits - Building codes	-
Direct intervention	- to withhold land for development for prevention measures o expropriation o pre-emption: right of first priority to acquire land - Permanent evacuation/resettlement - Preparedness: e.g. evacuation routes - Response: e.g. temporal settlement	-

[2] Table meant to provide an overview of the (potential) measures and policy instruments that are relevant and applicable in the Georgian context. In the last column tentatively the responsible authority could be indicated.

Annex Ib.

Risk reducing measures and policy instruments – land slides

Risk reducing measures		**Relevant/responsible authority**
Structural	- Drainage in the slope - Terracing of slopes - Retaining walls that put a load against the toe of the slope to prevent movement - Anchoring, rock bolting and soil nailing to add strength to rock or soil. - Galleries to protect transportation lines from rockfall or avalanches.	-
Non-structural	- Improved agriculture practices - Reforestation	-
Policy instruments		
Incentive instruments	- Subsidies, loans and/or fiscal incentives for implementing risk reducing measures (drainage, terracing) - Penalties/fines for certain risk increasing behavior (agriculture, buildings) - Land and property taxation - Insurance and mortgage policies (to adhere to certain norms, codes and land use regulations, e.g. building on steep slopes)	-
Communicative instruments	- Land slide/hazard mapping (e.g. web-based) - Local Community Development - Public awareness; Information and communication ➢ Public information ➢ Guides ➢ Campaigns ➢ Dissemination ➢ General education ➢ Radio or television broadcasts ➢ Use of printed media ➢ Information centres ➢ Networks and community and participation actions - Information and data sharing - Organisation and institutional building - Training (professional and academic) o Government Officials o Construction Specialists, engineers, builders, planners and architects o Land use planners o Tertiary Students o Building Maintenance Staff - Research (applied)	-
Regulatory instruments	- Zoning (macro; micro) - Protection measures - Controlling land use (intensity; seasonal) - Building restrictions - permits - Building codes	-
Direct intervention	- to withhold land for development for prevention measures o expropriation o pre-emption: right of first priority to acquire land - Permanent evacuation/resettlement - Response: e.g. temporal settlement	-

Annex II.

Example of Cost-Benefit Analysis for risk reducing measure

To conduct a proper CBA of a risk reducing measure the following parameters are minimally required:

- The investment costs of the risk reducing measure, specified annually over the years of the period of investment.
- The life time of the investment. Often this period is set at 40-50 years, sometimes even at 100 years. The principle here is the effective life time of the investment. In the case of a dam, i.e. the life time of the dam.
- The annual operation maintenance costs, where only the additional costs are considered.
- The year as from which the risk reduction measure will be effective
- The annual benefits of the risk reduction measures (usually measured in terms of avoided damage; alternatively in terms of expected increased land values)
- The interest rate at which benefits and costs are discounted. This interest rate is a measurement of the time value of money. This should not be confused with inflation. Inflation is usually not considered in CBA assuming that all costs and benefits change in a similar manner. The interest rate at which the benefits and costs are being discounted is an indication for the alternative investment opportunities. If the interest rate is high, many alternative investment opportunities exist and benefits and costs at short term are relatively higher valued than benefits and costs at longer term
- Of all the above parameters the estimation of the benefits is the most difficult and challenging.

A simple example (source: Westen, C. van (Ed.) (2009), exercise 7b, RiskCity)

- Investment in a flood retention basin: $ 25,000,000
- Investment period: 3 years
- Life time flood retention basin: 40 years
- Operation and maintenance (removal of sediments and maintenance drainage equipment): $500.000 per year.
- Yearly risk reduction benefits (reduction of avoided costs): 16.190 as from the 4th year

Flood mitigation Scenario				in million
annual risk reduction (as from year 4)				16.190
year	**risk reduction**	**invest costs**	**Maintenance**	**incre benefits**
1	0.000	8.333	0	-8.333
2	0.000	8.333	0	-8.333
3	0.000	8.333	0	-8.333
4-40	16.190	0	0.5	15.690

- Applying an interest rate of 10% to the above stream of net incremental benefits over the 40-year life time of the project results in a Net Present Value of: +$ 93,600.= (an function easily available in Excel)
- Net Present Value is calculated with the following- formula:

$$\sum_{t=1}^{t=n} \frac{B_t - C_t}{(1+i)^t}$$

Where:

B_t = benefit in each year
C_t = cost in each year
t = 1, 2, …, n
n = number in years
i = interest (discount) rate

- Net Present Value gives the discounted net incremental benefits and if this value is positive the measure can be considered as efficient.