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Chapter Six

**INTERVENTIONS, EFFECTS, OUTCOMES,
BENEFITS, AND COSTS**

ABSTRACT

Interventions are actions (processes) by humans to prevent, attenuate, create, or augment change(s). Resources (human, material) are consumed in the production of change. In disaster work, interventions are designed to: (1) affect the probability that damage will occur from an event; or (2) effect recovery. The definitions and implications of the terms: effects, outcomes, outputs, efficiency, effectiveness, efficacy, benefits, and costs (human, material, opportunity) as well as cost-effectiveness and cost-benefit are discussed. A new concept of Best Outcome Without Assistance (BOWA) is presented. Responses and interventions directed at prevention or mitigation of the damage produced must be evaluated from the perspective of their outcomes and to what extent they benefit the societies affected or at risk in relation to the goals and objectives defined prior to implementation of the intervention(s).

Keywords: actions; benefits; Best Outcome Without Assistance (BOWA); change; costs; damage; effectiveness; effects; efficacy; efficiency; goals; interventions; outputs; objectives; outcomes; processes

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AS NOTED IN THE foregoing Chapters, damage is negative physical or functional changes caused by the impact of an event. Interventions are actions by humans to prevent, attenuate, create, or augment change(s). All interventions have goals and objectives and produce effects and outcomes. As such, interventions may be directed at:

1. Elimination or modification of hazards or their respective risks for evolving into an event;
2. Enhancing or improving the absorbing capacity of the society and/or the environment to withstand an event should it occur and thus, mitigate the damage sustained; or/and
3. Returning the society to its pre-event functional status.

Interventions can be evaluated in terms of the effects resulting from their implementation, the outcomes relative to pre-established goals, the overall benefits accrued by implementation of the intervention, and the costs encumbered by their planning and implementation.

INTERVENTIONS

Interventions include all actions designed to improve the status of a society at risk or the status of one that has sustained damage from an event or events. As noted in the foregoing chapters, the status of the society at risk may be enhanced by elimination of a hazard or by modifying the risk that a hazard may become an event, or by enhancing the resilience of the society at risk. Interventions are designed to create *change*. Interventions are a transformation process (Figure 6.1). They are designed to change the status of something into a *product* called the *output*.¹ Interventions are *processes*. Resources (human and/or material) are required to create the change(s). Thus, all interventions have costs associated with their planning and implementation. All interventions must have predetermined goals and objectives and these goals and objectives must be coordinated with the overall planning in the society. The coordination should be provided by government agencies for the locality, region, or country for which they are proposed. Evaluations seek to establish the value of the interventions after their implementation.

Interventions may be classified as to whether they are designed to: (1) Affect the probability of damage occurring from an event; or (2) Effect recovery. All of the interventions directed at changing the probability that damage will occur from an event, must have the goal of producing a positive

benefit to the society by decreasing the amount and types of damage that will result from the occurrence of the event for which they are proposed. They are directed towards decreasing one or more of the elements described in the formula discussed in Chapter 4. Those that are designed to contribute to the relief or recovery processes for the stricken society must have goals that will aid in relieving pain and suffering of the affected community and/or enhancing the recovery process. They are more easily evaluated/measured than interventions whose success are measured by the absence of damage (e.g., absence of war related to the North Atlantic Treaty Organization (NATO)). Such evaluations often are difficult, as their success is assessed by the fact that nothing happened that could have happened. They could be assessed by the extent to which they produce intangible values (e.g., basic trust, security, etc.).

Often, interventions are grouped together as projects. Projects may consist of one or more interventions, each with an explicitly specified goal or set of goals. Projects also may have an over-riding goal(s) with each of the interventions comprising the project contributing to attaining the overall goal(s). In some instances, a project may have an overall positive impact, even though some of its component interventions may have been ineffective

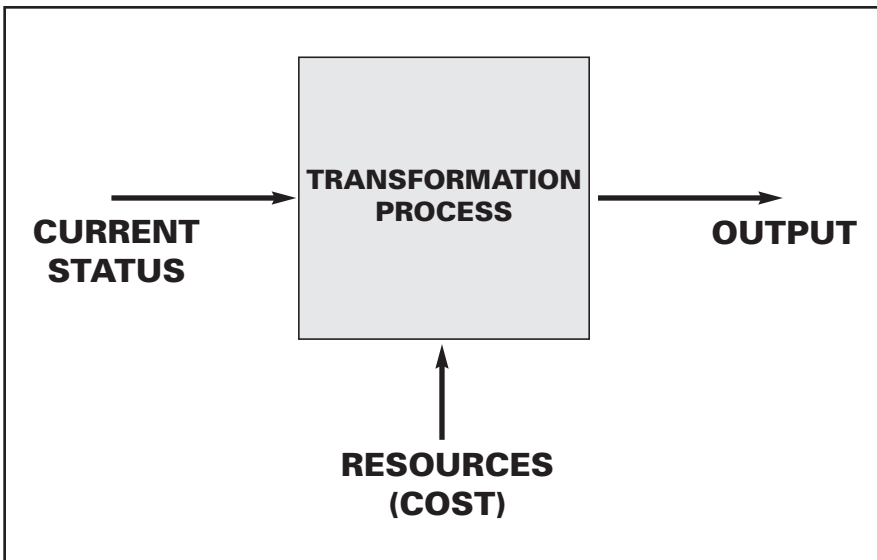


Figure 6.1—The transformation process. The current status is modified by resource-consuming interventions to produce an output.

or even produced a negative effect.

Changes that result from the implementation of an intervention only can be judged relative to a baseline established either prior to the implementation of the intervention or relative to a baseline established during the pre-event stage. The changes resulting from application of an intervention are called *effects*, and if they relate to the goals and objectives for which the intervention was designed, these results are called *outcomes*. Effects and outcomes are not necessarily the same. All of the outcomes from an intervention are effects of the intervention, but not all effects constitute outcomes. Interventions may produce outcomes consistent with the goals of the intervention and/or they can result in effects that were not expected in the design of the intervention or project. In either case, the effect (output) of the intervention may have been expected, but the effects achieved proved to have little relationship to the goals for which the interventions were designed. Effects may have positive or negative outcomes or a combination of both upon the society for which they were implemented. The effects not only should be evaluated in terms of the outcomes (goals) for which they were designed, but also must be evaluated for the impact they have created on the entire society and on the composite efforts for relief and recovery. It is possible that the goals for which the intervention (project) was designed were achieved in whole or in part, but the overall effects on the society may have been negative. For example, the achievement of elimination of a hazard could produce additional hazards or increase the risk of another hazard being released. The goals may have been short-sighted and the vision too narrow. The intervention potentially could impact in a positive or negative way upon the other Basic Societal Functions (BSFs) that did not relate directly to the goals of the intervention in one of the BSFs. Results must be judged not only in the context for which they were designed, but on their effects on the overall status of the community. Identification of the effects from the implementation of an intervention, therefore, must be broader than just evaluating whether and to what degree the goals were or were not achieved. The overall impact on the society for which they were implemented must be considered. Very little [possibly nothing] happens in isolation.

EFFECT(S)

An *effect* is the result or consequences of action.² *Effects* are the results of interventions (outputs of the transformation process). The effects of the responses

consist of *the consequences of the responses/interventions*. The effects may be single, but often are multiple and may involve multiple basic components. Effects related to the goals and objectives are called *outcomes*. Clearly, not all of the effects of the implementation of an intervention can be labeled outcomes. In these Guidelines, effects are the results of an intervention.

OUTCOME(S)

Outcome in the context used in this discussion refers to the results of specific interventions or projects relative to their pre-established goals and objectives on the population. Outcomes are analogous in many ways to the primary and secondary endpoints defined in experimental research studies. Outcomes can be the result of interventions designed to eliminate hazards, decrease the risks, and/or enhance the absorbing capacity of the society at risk. Outcomes of any intervention may reflect either a positive or negative result for the society in any of the above aspects of disasters. For the sake of simplification, the term cost-benefit will be used also when an intervention has a negative outcome as valued by the population it is meant to serve.

EFFICIENCY

Efficiency is the noun of the adjective, *efficient*, which is defined as production with a minimum of waste or effort.^{2,3} Thus, *efficiency* is the state of being efficient.² In this context, efficiency relates to the relationship of the output to the resources consumed by the specific interventions used in creating the change: the smaller the consumption of resources to achieve the desired change, the greater the efficiency of the process used to achieve the change. It is a reflection of how well an intervention is conducted in achieving the change. It is a process variable. Processes (interventions) should achieve their desired effects with the highest possible efficiency.

EFFECTIVENESS

In the context of this discussion, *effectiveness* is the ability of the intervention being evaluated to have achieved the objectives and goals for which it was implemented.² If an intervention was aimed at recovery of at least the critical threshold for one functional element of the affected society, then the effectiveness was whether the critical threshold was achieved for that element designated in the objective of the response. Put in another way, the effectiveness relates to how close the output (effects) matches the specified

goal. Thus, when an intervention is directed at meeting some defined need and the need, in fact, is decreased, then the intervention was effective. Different interventions can be compared in their ability to achieve the same effect or output (cost-effectiveness).

EFFICACY

Efficacy is the ability of an intervention to produce the desired effect.² In this context, it is identical to effectiveness, except that it always is a positive term.

BEST OUTCOME WITHOUT ASSISTANCE (BOWA)

The goal of any intervention is to result in a change or changes in a positive direction (recovery) as assessed through the use of indicators. Most often, any changes that occur in an indicator or set of indicators generally are attributed to the intervention. Such changes are evaluated through the assessments conducted across time and constitute longitudinal studies. Longitudinal studies are subject to confounding influences that may have little, if anything, to do with the intervention being assessed. Thus, the change may or may not be due to the intervention. In Figure 6.2, A is the situation in a society before and B is the situation after an intervention (I). In mathematical terms, if $I = 0$, then $A = B$. In a dynamic situation, a society probably would have some inherent mechanisms for change, and $A \neq B$, even when $I = 0$.

Therefore, an aspect that should be integrated into any discussion of outcome, is the concept of identifying what would have been the Best Outcome Without Assistance (BOWA).¹ Points of reference tend to be

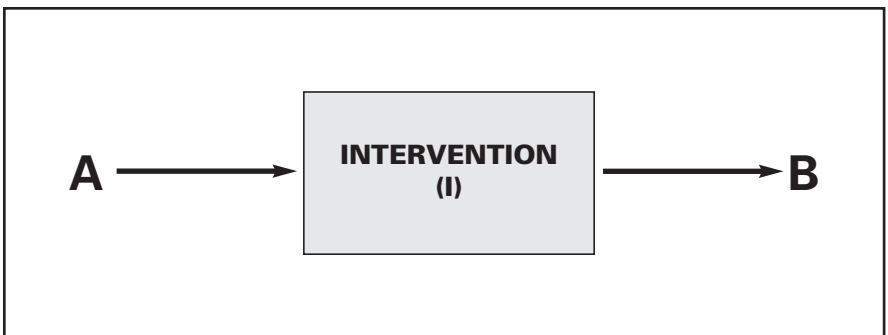


Figure 6.2—The transformation process as related to disasters (The resources consumed are not indicated in the diagram)

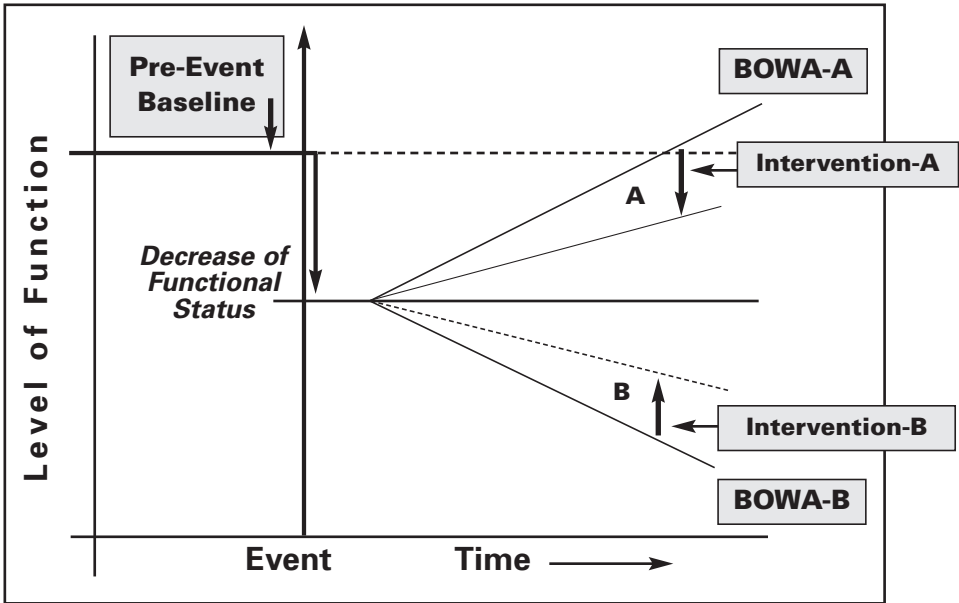


Figure 6.3—The effects of recovery from an acute event in two societies (A and B). Following the immediate decrease in the functional status associated with the a sudden-onset event, the functional state for Society A would have continued to increase to BOWA-A without assistance, but with assistance (Intervention A), Society A did not achieve BOWA-A. The effects of Intervention-A actually impeded the recovery of Society A. On the other hand, the functional state of Society B would have continued to decline following the event, but Intervention-B attenuated (b) the decline to BOWA-B. In the perception of the public, it is likely that Intervention-A would be deemed the most successful.

described in static terms; however, a society never is static: it is dynamic, moving from one state of development to another. Such movements either may be positive or negative, sometimes for the society as a whole, sometimes only for special elements within the society.

In a disaster stricken area, this dynamic state may take on even greater importance. The self-healing capacity of the country impacted may be very limited and/or the situation may have been deteriorating prior to the event that resulted in the disaster. In such circumstances, the event may result in an augmented rate of decline. In other areas or countries, the local population may be able to establish adequate coping mechanisms without outside assistance, and hence, no disaster results. Furthermore, as illustrated in

ⁱ BOWA has been developed from BATNA (Best Alternative to Negotiated Agreement), a similar concept developed for negotiation processes.

Figure 6.3, an organization that intervenes in a situation in a society that is suffering from negative development and only is able to reduce the rate of deterioration, may be doing a better job in response to the event than an organization that is able to demonstrate a positive development during the post-event phase. Therefore, the end-point of returning the societal function to the pre-event state (Point of Reference) always has a built-in error. As these Guidelines evolve, ways to incorporate BOWA into these Guidelines will be identified.

BENEFITS

A benefit is a favourable or helpful factor or circumstance.⁴ Thus, the benefits associated with a specific intervention in the current context, is the value attached to the outcome produced by the intervention. It is the gain (or loss) to the affected society related to the intervention. Interventions may produce positive or negative outcomes. For simplification, the term *cost-benefit* will be used also when an intervention has a negative outcome as valued by the population it is meant to serve. Negative outcomes are detrimental to the affected society. Thus, negative outcomes decrease the perceived value of the intervention, even when the output may have been positive in terms of achieving the defined effect from an intervention. The provision of unmarked and outdated drugs that are not needed by an affected society may meet the goal of the donor to provide drugs, but not the need of the affected population. Such drugs also may cost the recipient community substantial resources in transporting, inventorying, and even disposing of the unneeded materials.⁵⁻⁹ The net result of the performance of evaluations is to assess the value of the results of an intervention. Benefits may be difficult to quantitate and qualitative descriptions may be required. The value of an intervention then, is related to how well it is perceived to have helped meet the defined need for which it was designed.

COSTS

The costs of an intervention are the resources consumed by the transformation process. Most often, the costs are given a monetary or economic value. The *economic costs* are a combination of the material costs and the quantity of time donated by individuals, the loss of income they incurred during the period of absence from their jobs, the costs of medical care resulting from their response, etc. However, costs also can be assessed in terms of human, material, intangi-

ble costs, and other resources consumed.

Human costs include the loss of life and the morbidity (physical and psychological) that result directly from the event or from the circumstances associated with the disaster, the stresses endured within their responses (including absence from family and potential loss of regular employment), and other opportunity costs (including use of time that otherwise would have been used in other endeavors) associated with their responses. *Material costs* include the direct economic costs of materials and the costs of acquiring, packaging, shipping, unpacking, inventorying, and distribution of equipment and materials. Also included must be the opportunity costs associated with the use of the resources for the disaster responses rather than for other indications or wishes.

Opportunity costs are other factors sacrificed by using a resource in a particular way. All actions have some opportunity costs. Often, the worth of an application of resources is evaluated on the basis of the use of the resources in the manner in which they were applied compared to other potential uses. Thus, not all costs can be quantified in economic terms.

The costs associated with the responses that ultimately bring the status of the affected community back to its pre-event status tend to be used when describing the costs associated with a disaster. However, the costs associated with responses and recovery, lend themselves to further evaluation and analysis. The cost in these phases relate to the efficiency and effectiveness with which they are accomplished and to the benefits accrued from the responses. A method that can be used for the classification of costs is diagrammed in Figure 6.4. *Cost-efficiency* is a measure of the efficiency with which the response was carried out. It is useful for comparing the relative costs for activities within one system. Thus, it is an expression of the amount of resources consumed by the intervention. The resources may be expressed as a monetary price, person-hours of input, or as the opportunity costs.

The *cost-effectiveness* is the cost in terms of the resources consumed for a given measure of the goals achieved (effects).¹⁰ *Cost-benefit* is the relative value obtained for a given amount of resources consumed by the intervention process.¹¹ The values of the costs are measured with the same indicators for efficiency, effectiveness, and benefit. With regard to outcome, however, benefit often may be assessed using different indicators than are used for assessments of efficiency and effectiveness. The value may be expressed in terms of monetary gain or loss or improvement or deterioration in one or

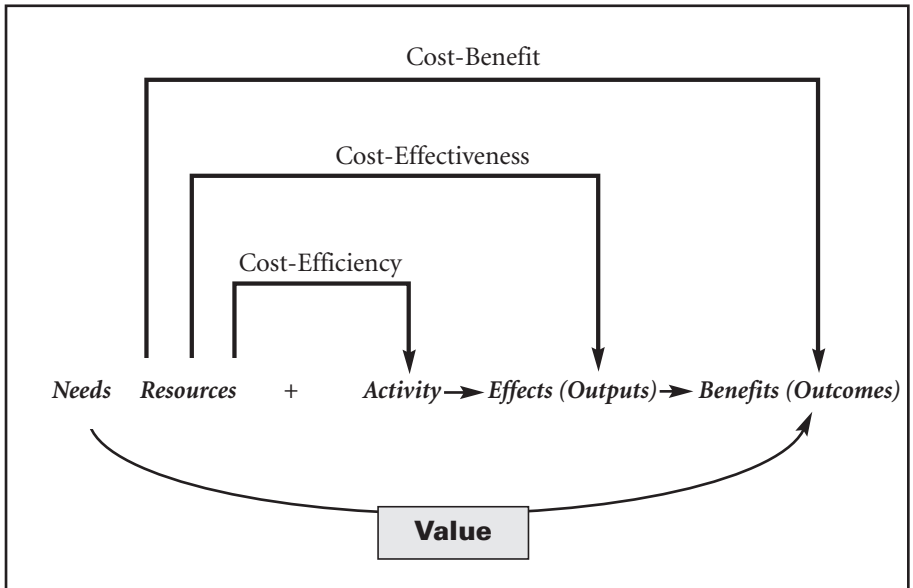


Figure 6.4—Diagrammatic representation of cost-efficiency, cost-effectiveness, and cost-benefit. Each intervention must be carried out as efficiently as is possible. The intervention that proves more effective to deliver the wanted output (effect) is chosen. It remains to be evaluated to what extent the intervention really benefited the population (produced a positive outcome)

more of the indicators, in the level of satisfaction of the recipients or workers, etc. For example, the cost-benefit could be the number of person-hours/life saved, number of persons no longer feeling hungry or thirsty, etc. In the worst case scenario, the benefit may be measured in variations of Crude Mortality Rate. In consideration of the benefits, assessments of the outcomes must include the effects of the intervention in other areas or basic societal functions (BSFs).

SUMMARY

Evaluation of the medical and public health responses to disasters is the principal objective of this work with an eye towards progressive improvement in our ability to respond effectively and efficiently to disasters. Such responses must be evaluated from the perspective of their outcomes and to what extent they benefited the beneficiaries, especially relative to the goals of the responses. However, interventions also may be evaluated with regard to prevention or mitigation of the effect of an event. Such evaluations often are difficult as

their success is assessed by the fact that nothing happened that could have happened. They could be assessed by extent to which they produce intangible values (i.e., basic trust, security etc.).

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