Concept Note

Sanitation Safety Plans (SSP):

A vehicle for guideline implementation

This note serves as an introduction to the concept of sanitation safety plans, which aim to facilitate the implementation of the guidelines for the safe use of wastewater, excreta and greywater in agriculture and aquaculture (WHO, 2006). It provides background information on the links between sanitation and human health, recent developments with respect to sanitation policies and updates on access and use of sanitation. This concept note also elaborates on the context, contents, and possible objectives and boundaries of sanitation safety plans, and highlights questions that remain unanswered and merit further discussion. The intention of this concept note is to serve as a basis for discussion among stakeholders in safe sanitation and wastewater use, scientists, managers and practitioners, in order to generate ideas and interest to contribute to the development of a Manual on Sanitation Safety Plans.

Background

Sanitation & health - the narrow picture

On July 28 2010, the UN General Assembly adopted a non-binding resolution calling on states and international organisations "*to scale up efforts to provide safe, clean, accessible and affordable drinking-water and sanitation for all*". As a result, drinking-water and sanitation are now enshrined as basic human rights. (Lancet, 2010).

Adequate sanitation is essential for the protection and promotion of individuals' and community health and enables a productive and dignified live. Access to basic sanitation, linked to proper 'use and disposal', can substantially reduce diarrhoeal disease, intestinal worm infections and vector-borne disease. The reduction in incidence of diarrhoeal infection has been estimated to be up to 32% (WHO, 2008). In contrast, lack or improper use of sanitary installations, as well as inadequate containment, treatment or handling of the resulting excreta and wastewater will impact on both human disease incidence and mortality, via multiple routes of exposure. Inadequate disposal also contributes importantly to the degradation of the environment.

Multiple human exposure pathways, the quantity of pathogens, local environmental and climate conditions, the capacity to deal with waste and the attitudes, knowledge and believes related to human waste are all closely linked to sanitary safety. The pathways include the fecal-oral pathway of infection through direct or hands-mouth contact or through foodstuffs. Other pathways involve exposure to contaminated soil: e.g. hookworm infection is spread through larval penetration of the bare skin. Unimproved latrines may serve as breeding places for certain disease vectors (mosquitoes, houseflies) (e.g. lymphatic filariasis and blinding trachoma – therefore, transmission by vectors provides yet another pathway that can be tackled by improved sanitation.

In light of the above, there is an obvious need to assess, prioritize and manage sanitation in a systematic manner both for the 2.6 billion people estimated to lack access to improved sanitation facilities (WHO/UNICEF, 2010), as well as in relation to different existing installations, treatment and disposal or reuse options. Despite its vast effects on public health and clear epidemiological evidence, political commitment for sanitation continues to be insufficient. Sanitation safety planning may function as a tool to promote and facilitate the priority setting and management of sanitation for the future.

Sanitation and health - The broad picture

Sanitation has a broader scope that goes beyond the strict disposal of human waste. Indeed, sanitation is the hygienic means of promoting health through prevention of human contact with the potential hazards posed by wastes, including either physical, microbiological, biological or chemical agents of disease. The assessment and planning from a systems perspective therefore needs to account for the risks but also for the benefits of use of wastewater, excreta and greywater (in agriculture and aquaculture), either partially or wholly treated, or the treatment and further impact for the release back into local ecosystems. Such a systems approach also accounts for further impacts on humans in the management of waste, and thus covers recreational waters and the management of solid waste, as well. The secondary effects of sanitation assessed through environmental determinants of health - traditionally addressed through environmental management- can partly be addressed within the same framework, thus also including the receptiveness of the environment to disease transmission at large.

Water safety plans (WSP) serving as a model for sanitation safety plans (SSP)

The publication of the third edition of the WHO Guidelines for Drinking-water Quality (WHO, 2004) introduced the concept of integrated, preventive risk management through water safety plans (WSPs) as a means to put in to operation the principles, standards, norms and best practice proposed by the Guidelines. Using health-based targets as a point of departure, WSPs provide a systematic approach towards assessing, managing and monitoring risks from catchment to consumer. It provides a way of structuring and applying tools, methods and procedures to replace end-of-pipe measurements of water quality by a *hazard analysis critical control points* (HACCP) approach, referring to a series of actions to be taken to ensure safety of the drinking-water supply chain at critical control points. WSPs follow the logical sequence of this chain and enable system-tailored hazard identification and risk assessment/management.

Based on an earlier edition of the WHO Guidelines for the safe use of wastewater and excreta (WHO, 1989) and as a response to the increasing use of wastewater in agriculture and the needs to account for the benefits of plant nutrients in human waste, WHO, in collaboration with UNEP and FAO, updated the Guidelines for the Safe Use of Wastewater, Excreta and Greywater in Agriculture and Aquaculture (WHO, 2006). This third edition of the Guidelines explains how the practice of wastewater use can be pursued in a safe way. The methods and procedures proposed followed the same principles of HACCP. It therefore follows, as a logic that mirrors the use of water safety plans to render the WHO Drinking-water Quality Guidelines operational, that the development of a concept of wastewater or sanitation safety plans is needed for a similar purpose. A technical seminar at the 2009 Stockholm World Water Week recommended the term sanitation safety plans because of the opportunity it implies to place safe use of wastewater in a broader sanitation context.

Essential actions

As with WSPs, sanitation safety plans would aim to assist in the application of the Guidelines. Sanitation Safety Plans should comprise three essential actions. Firstly, a *system and exposure assessment*, which refers to mapping the system and identifying potential risks along the sanitation chain. This involves the collection of all available and relevant data on the sanitation system in question from the users to the reuse/disposal and downstream effects. Risks that may appear in the different components of the sanitation system need to be assessed and ranked according to the measures of 'likelihood' and 'severity'. The exposure levels of different vulnerable groups need to be established. It is important to consider all routes of exposure in order to make adequate estimates, ranking and prioritization. This first action component, implemented in the context of a system assessment, provides the basis for planning and implementing a sanitation safety plan.

Secondly, *operational monitoring* is a key action component, aimed to establish control measures for previously identified and ranked hazards and exposures at critical control points in the chain, and a mechanism to ensure that a failure to control such are being detected in a timely manner. Operational monitoring mainly includes simple measures that can also be pursued in settings where training opportunities for workforce may be limited and can be carried out on a day-to-day basis. Examples are given in the guidelines and may range from the integrity, use and containment conditions of a latrine, the emptying practices, fencing around sludge collection sites, and irrigation application and crop selection in waste-water-irrigated fields. Mechanisms of operational monitoring should reflect the likelihood and the consequences of a loss of control. Operational monitoring may also function as a base for further definition of parameters and critical limits. When considering existing systems, operational monitoring serves to reveal the need for upgrading, restoring and extending the system for better performance. Verification monitoring is relevant as a back-up in already well-defined systems. Details on objectives and means of monitoring components are covered in the Guidance Note on Health-based Targets in this information kit (Gordon and Bos, 2010).

Thirdly, the actions comprise a *management* component, referring to a plan of actions and control measures for normal conditions and incident situations. It defines procedures for the normal variation in operational monitoring parameters, and management procedures for predictable incidents accounting for sudden changes as well as emergencies. With corrective actions and their execution at its centre, the management component aims to minimize risks and maximize benefits. Management furthermore encompasses up-to-date training of health and surveillance staff and, where appropriate, operators, as well as supporting measures and documentation of all procedures.

Similarities and differences between WSPs and SSPs

The concept of sanitation safety plans builds on the structure of water safety plans, with several similarities, but also with significant differences between the two as summarized in Table 1.

Introducing sanitation safety plans as a new policy tool

The introduction of sanitation safety plans in any given setting aims at providing access to and promoting safe sanitation, managing the safe disposal of waste and protecting communities from associated risks. The main objectives of sanitation safety plans are:

- First, safe use of sanitation facilities, including both technical and behavioural aspects.
- Second, the creation of effective treatment and non-treatment barriers. This includes on the one hand the reduction of exposure along the chain of handling and disposal and, on the other hand, the protection of waste and wastewater from contaminating freshwater sources. Both help reduce microbial risks to human health. In addition, it includes the protection of wastewater from chemical and radioactive contamination, in particular in cases where it is intended for further use in food production.
- Third, the implementation of guideline values and best practice to ensure the safe use of wastewater, excreta and greywater in agriculture and aquaculture.

Table 1. Similarities and differences between Water Safety Plans and Sanitation Safety Plans.

Sanitation Safety Plans	**Water Safety Plans**
Similarities	
Derived from WHO Guidelines for the safe use of wastewater, excreta and greywater	Derived from the WHO Guidelines for Drinking-water Quality
Incremental risk management approach, HACCP, Stockholm Framework	Incremental risk management approach, HACCP, Stockholm Framework

Essential actions - system assessment - operational monitoring - management	Essential actions - system assessment - operational monitoring - management
Systematic nature, following the sanitation chain	Systematic nature, following the drinking-water supply chain
Differences	
The systematic approach expands to downstream health and environmental effects	The systematic approach remains confined to the drinking-water supply chain
Considers multiple routes of exposure and multiple exposed groups in relation to microbiological and chemical risks	Focuses mainly on drinking water ingestion, considering microbiological, chemical and radiation risks
Usually no clear regulatory framework, with roles and responsibilities fragmented over different sectors and levels	Usually operates in a clear regulatory framework
Diversity in the decision-making process	Uniformity in the decision-making process
Objectives: - reduce the exposure and negative health and environmental impact of wastewater, excreta or greywater disposal and use - prevent wastewater from contaminating fresh water sources and produce	Objectives: - prevent drinking-water from being contaminated
Implementing agency: may vary, national, regional or local authorities, depending on available resources and skills	Implementing agency: water utility, or for small community water supplies: a community association

Scope of the sanitation safety plans

As a tool, sanitation safety plans should be both comprehensive and flexible. They should allow settings in both developing and industrialized countries to be covered and address all types of sanitation systems whether they are organized by large-scale municipal or regional utilities or by communities. As for communities, the concept of the sanitation ladder proposed by the WHO/UNICEF Joint Monitoring Programme on Water Supply and Sanitation (WHO/UNICEF 2008) may be integrated, in order to allow communities using their position on the sanitation ladder as the starting point to develop an appropriate sanitation safety plan. These plans will particularly serve risk management approaches in settings where wastewater or other waste products from sanitation are used for agriculture or aquaculture, but they will also serve as a useful tool for the safe disposal of end-products. A HACCP-approach for sanitation must be applied equally to existing systems and to new elements being integrated into these.

Wastewater and excreta use in agriculture and beyond

The scope of sanitation safety plans may extend well beyond wastewater and excreta use in agriculture, when considering for instance also solid and chemical waste disposal. Nonetheless, the productive use of waste is an important starting point, bringing into the equation livelihood issues and the economic value of nutrients and water in relation to sanitation, which would be absent otherwise. This perspective of other benefits than health provides added incentives that support the promotion of the sanitation safety plan concept. Safe wastewater and excreta use in agriculture and aquaculture has large potential for the sustainable use of water and improved food security. Using human waste as fertilizer in a safe and structured manner increases agricultural production and sustains the livelihoods of vegetable and fish farmers; it also permits to grow crops close to the consumer, in particular in urban and periurban areas. Wastewater and greywater add to the reliable supplies of water for agriculture in arid climates and are a relatively cheap source of plant nutrients. A comparison of farmers using wastewater and farmers not using wastewater in the same area

revealed that the annual income of the former may be 30-50 percent higher (IWMI, 2006). Additionally, improved and secured food production result in increased job opportunities e.g. for traders, vendors and other service suppliers. Using wastewater for irrigation also reduces the need for chemical fertilizers, limiting both costs and health risks for famers. Despite these advantages, there are two major challenges to be encountered in this context. First, there is often a lack of demand for improved sanitation among poorer communities, which is the point of origin for the safe use of wastewater in agriculture, a challenge that has been addressed by promoting demand-inducing sanitation programmes. Secondly, the fragmentation of sanitation responsibilities over a number of governmental agencies needs to be considered when thinking of safe wastewater use in agriculture.

Policy & regulatory framework

In order to use sanitation safety plans as a means to ensure coherently and sustainably safe sanitation, a legal framework for establishing a policy on sanitation safety plans is necessary. Whereas in the case of Water Safety Plans regulatory authorities are responsible for its establishment, the responsible entity for sanitation safety plans needs to be clarified, which should preferably be in line with existing rules and practices, resulting in a number of conceivable options such as: municipalities, communities or wastewater managing organizations, including small-scale private sector operators, or farmer associations. It should be stressed that the use of wastewater in agriculture is practised informally in many regions, but that legalization is required in order to regulate these practices in a health-protective and -promotional manner.

Fostering intersectoral collaboration

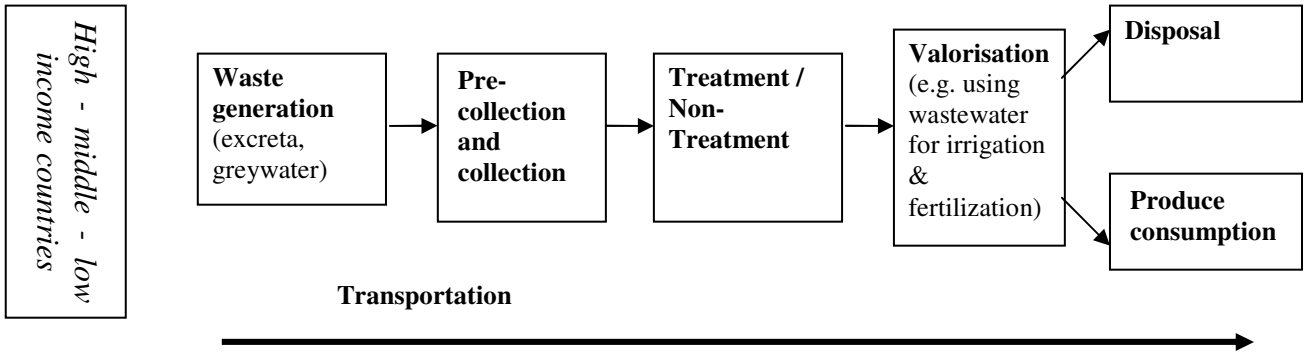
Acknowledging that sanitation is a public good, the public sector has to play a role in enabling its organization and regulation. Nonetheless, organizing sanitation is a diverse task that requires the involvement of multiple stakeholders. Possible stakeholders in excreta and greywater use programmes have been listed in the Guidelines (WHO, 2006 – volume 4) including users of sanitation facilities, users of the treated excreta and/or greywater, financial institutions, and research institutions. Links to sectors relevant for sanitation include urban planning, housing, health, education and agriculture. The latter is particularly pertinent for cases where the use of wastewater in agriculture is the focus of sanitation safety plans. It is essential to recognize that the everyday life of a farming community integrates aspects of different sectors such as health, agriculture, construction, trade, sanitation and water naturally. Similarly, the integration of various sectors along the political continuum should reflect the diversity of community members' tasks in order to ensure a participatory and sustainable approach in development in implementation of sanitation safety plans. Local governments or other authorities/groups wishing to develop and implement a sanitation safety plan should involve stakeholders and experts in a comprehensive manner, respecting the needs and the available resources of the setting in question.

Adopting Sanitation safety plans in different settings

Components of wastewater systems & possible pathways - the sanitation chain

Sanitation safety plans should be organized along the sanitation chain, ranging from waste generation, collection, treatment or the implementation of non-treatment options, respectively, valorisation, which refers to the use of wastewater, excreta or greywater for irrigation and fertilization practices, to the disposal of waste products and produce consumption. Furthermore, transportation, which may be piped or non-piped, needs to be seen as a recurring step in the chain, linking one element to the next, requiring equal attention in the risk management approach. In different settings different pathways along the chain may be taken, and there may be more or less steps than those suggested in the flowchart below, which provides a general scheme for orientation; more elaborate flowcharts can be found in the guidance note 'Applying the Guidelines along the sanitation ladder' (Drechsel and Keraita,

2010, in the information kit). This is applicable to different options along the sanitation chain, from basic to advanced, accounting for situations from open defecation or unimproved sanitation facilities with basic manual emptying and use or disposal, to water-based piped systems, with different treatment, reuse or disposal characteristics. This reflects on the concept of the 'sanitation ladder' beyond the technical dimension towards a focus on exposure and critical control points. This is in line with the concept of the guidelines on the safe use of wastewater, excreta and greywater: the different levels of economic development and the available options for the safe use in agriculture are taken into account. Drechsel and Keraita describe the ladder with the high-income countries where wastewater treatment and irrigation generally is a planned process, to the middle-income countries that are trying to move from informal to controlled wastewater use and to the low-income countries often facing a situation of insufficient capacity for wastewater treatment, where wastewater irrigation most often is practiced informally.



Points of exposure in the sanitation chain

The sanitation chain has multiple points of exposure which should be considered when adopting sanitation safety plans in different settings. For every element in the chain there may be several options, mainly determined by the given setting's level of development. Evidently, exposure to certain hazards will be less significant with a higher level of technology and treatment, and consequently lower quantities of microorganisms or chemical constituents, but it is nonetheless required to assess the points of exposure in any system carefully when developing sanitation safety plans, in the spirit of HACCP. Examples of multiple exposure points are presented in the box below.

- Waste generation
  - Dry latrines- improved/unimproved
  - Flush toilets
  - Ecological loop toilets
- Transportation
  - Manually
  - Motorized
  - Sewerage-System
- Pre-collection and collection
  - Buckets
  - Septic tanks
  - Pre-collection sites
- Treatment/ Non-treatment
  - Waste stabilization ponds
  - Constructed wetlands
  - Sedimentation
  - Filtration
  - Coagulation/ Flocculation
  - Disinfection
  - Pathogen-die-off
- Valorisation
  - Irrigation (drip/ spray)
  - Fertilization
  - Fodder for livestock production (duckweed/ fish)
- Disposal
  - Reintegration into aquatic cycle
- Produce consumption
  - Food trade
  - Food preparation
  - Food consumption

Communication

Communication is essential in any health promotion intervention. In the context of sanitation safety there are two aspects to it. Firstly, since cross-sectoral collaboration requires effective communication in order to be carried out efficiently, good communication is required among those designing sanitation safety plans. This will help avoid conflicting messages and increase public trust. Secondly, in order to adopt sanitation safety plans as a policy, communication is necessary for advocacy, in order to create an environment of knowledge that will facilitate decision-making and implementation. It is important to inform and involve the community pro-actively to implement the guidelines in a way that they are acceptable and the public perception of waste use in agriculture is positive. It is essential for the protection of consumer health to maintain good and transparent public relations and to phrase key messages understandable to the audience, considering its educational level. While respecting the diversity of communities when planning a communication approach, it should always reflect the realities of the people in question, including their attitudes, beliefs and lifestyles.

Developing a Manual on Sanitation Safety Plans

A more hands-on approach to the application of the Guidelines is clearly needed. The elements presented in this concept note on sanitation safety plans indicates they are likely to have a value as a complementary policy tool, facilitate guidelines' adoption in different settings and ensure that the combination of guideline values and best practice proposed by the Guidelines are applied in an optimal manner to achieve the incremental impact envisaged. The experiences with the application of the Guidelines in Ghana, Jordan and Senegal also lead to the conclusion that a Manual on Sanitation Safety Plans is desirable in order to put

them into practice and make them accessible to a broader target audience (WHO, 2010). The development of a Manual may contribute to an improvement in the global sanitation situation, in a situation where we know the MDG sanitation target is considerably off-track. The Manual will enable governments at different political levels to design a sanitation safety plan which is appropriate to their setting. It will facilitate the use of health-based targets and provide a basis for incremental risk management under the umbrella of sanitation safety plans.

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