

# Chapter 1

## Re-conceptualizing the sanitation value chain

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### Chapter objectives

The objective of this first chapter is to present the integrated functional sanitation value chain (IFSVC) map to get an overview of the stages of the IFSVC, the actors and their functions in the value chain, and also the flow of products and services through the chain. The general IFSVC map also provides information on governance and enabling systems.

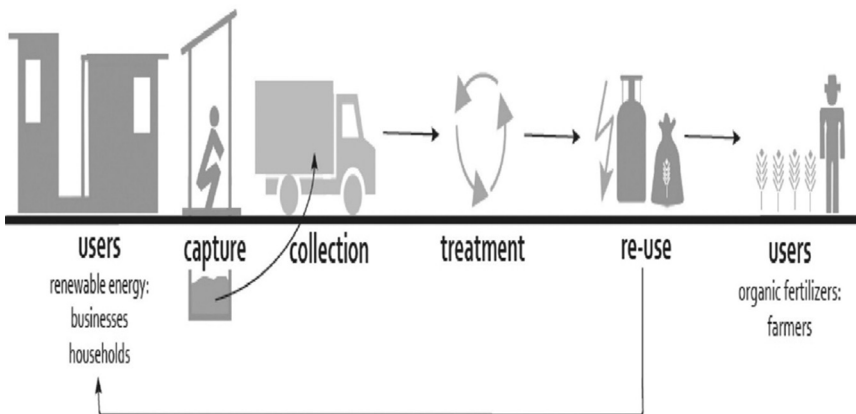
### 1.1 INTRODUCTION

The value chain (VC) system is a key way to address important sanitation technological and institutional gaps in production and service delivery (Drost *et al.*, 2012) and could constitute a natural platform for development actions and also serve as a market systems approach to improve access to safely-managed sanitation (Springer-Heinze, 2018a). The value chain concept is used to gain a better understanding of how and where enterprises and institutions are positioned within a chain and identify opportunities and potential leverage points for improvement (Rawlins *et al.*, 2018). Sanitation value chain (SVC) actors and/or enterprises have several interests in common and all depend on the same end-markets to be successful whereby it is necessary for them to interact with each other and the same enablers and supporters to reach the market. The SVC provides the sustainable market that enables more customers and entrepreneurs to exchange products and services, thereby increasing market depth and reducing the burden on public finance. VC also optimizes the finance, products and information flow that enterprises can identify and exploit for new opportunities and to reduce external threats (Springer-Heinze, 2018a; USAID, 2018).

This book considers the sanitation value chain (SVC) to be the full range of activities that are required to bring a product and/or service from conception through the different phases of production to delivery to final consumers and disposal after use (Kaplinsky, 2000, 2002; M4P, 2008). In a narrow sense, this includes the range of activities performed within a firm to produce a certain output (Porter, 1985), while in the broad approach, it is a complex range of activities implemented by various actors (primary and secondary

producers, processors, traders, service providers) to bring products and/or services from conceptualization through chains to the sale of product and/or provision of services (M4P, 2008). This approach does not only look at the activities implemented by a single enterprise, but also includes all its backward and forward linkages, until the products and services are linked to the end-users in an 'integrated-functional' system (Kaplinky, 2000, 2002; M4P, 2008). Thus, this concept encompasses the issues of organization and coordination, and the strategies and the power relationship of the different actors in the chain (M4P, 2008). This, however, is different from the usual perspective of the value chain in the sanitation sector whereby the SVC is depicted as actors and businesses within the sanitation service chain (SSC) and other enterprises involved in faecal sludge and sewage management (FSM) which are aspects of the sanitation value chain (SVC) (Strande *et al.*, 2014; WWAP, 2017). The SSC and FSM are descriptive frameworks with distinct technological steps showing the flow of sanitation service provision to end-users and do not really represent the whole picture of the sanitation value chain (SVC) (Hyun *et al.*, 2019; Osann & Wirth, 2019). This is a restrictive use of the concept of value chain because it is focused within the SSC actors and local businesses involved in FSM activities alone, but these are just stages/levels in the sanitation value chain (see Figure 1.1).

Using the SSC as the SVC may only capture the value-added activities at the sanitation services stages of the integrated functional sanitation value chain (IFSVC), which has probably led to misconceptions by some practitioners that the value that could generate additional financial flow in the sanitation system is at the back end of the SSC (Murray & Ray, 2010). This misleading perspective limits the efficiency and practicality of the complex sanitation value chain and could interfere with the circular bioeconomy potential of the sanitation economy (Akinsete *et al.*, 2019; Koottatep *et al.*, 2019). The reconceptualization of the SVC is supported by Hyun *et al.* (2019) when they provided an augmented sanitation service chain (ASSC) and called for the redesigning of sanitation systems that could contribute to better health and cleanliness, climate change adaptations, support for sustainable food systems, and human rights for the poorest communities. The ASSC concept expands upon the traditional SSC materials and social functions, such as the decision makers, key financial actors and how they affect other entities within the sanitation system. However, various materials flows, social functions,



**Figure 1.1** Sanitation service chain (SSC) used to illustrate sanitation value chain (SVC) (from van Welie and Romijn, 2018).

and the roles of actors in the chain that determine the goals were not originally part of the sanitation service and/or value chain (Hyun *et al.*, 2019). On the other hand, the ASSC also obscures other players in the SVC that do play active roles in the sanitation economy, and this actually provides more evidence for new perspectives of the SVC. The WWAP (2017) also aligned a financial flow model of faecal sludge management with the SSC to indicate where a utility achieves full cost recovery through discharge fees and revenues from selling treated faecal sludge (Strande *et al.*, 2014), but this did not properly identify the specific value-added activities that could drive the business model responsible for the financial flows and account for failure in most practical applications. It is evidence that there are missing links in the SVC as it is perceived currently, and that the complete linkages and interconnection within the sanitation markets could be explored and mapped to really understand, appreciate and properly activate the sanitation economy, particularly in developing countries.

Therefore, re-thinking the sanitation value chain (SVC) becomes necessary in order to provide better information and understanding of the firms that operate within the sanitation industry, from input suppliers to end market buyers, and the support markets that provide technical, business and financial services (Market Links, 2021). Such a broad scope for analyzing the sanitation industry is needed because the principal constraints to competitiveness may lie within any part of its stages and/or levels as well as the market system or the environment in which it operates (Market Links, 2021). Thus, the SVC should capture all the value-added activities and enterprises within the entire sanitation economy (Koottatep *et al.*, 2019), and should not be restricted to the SSC, but directed towards building an expansive SVC that could transform the sanitation economy. This perspective is critical for the innovation and great opportunities to drive design, production and services that not only match individual, societal and cultural expectations, but also activate cultural and behavioural changes that support socioeconomic well-being, provide employment, business and investment opportunities, as well as reducing human exposure to sanitation matter. One major obstacle in modernizing sanitation practices and integrating resource recovery is the need to ensure human health and safety throughout the sanitation value chain (Bischel *et al.*, 2019), and all of these will in turn boost the possibilities of achieving the SDG 6 sanitation targets and other related SDGs.

The SVC could enable businesses to evaluate their processes so that they could reduce operational costs, optimise efforts, eliminate waste, and improve health and safety, as well as increase profitability (Reese *et al.*, 2016). It also conceptualizes activities needed to provide products or services to customers and depicts the way a product gains value (and costs) as it moves along the path of design, production, marketing, delivery and service to customers (Springer-Heinze, 2018a, 2018b). Furthermore, it includes all producing and marketing enterprises operating in the entire sanitation sector that create and deliver services in the sanitation market such as product and service design and development (Chapter 2); manufacturing of infrastructure (fixtures and fittings) as well as consumables (like hand sanitizer, toilet paper, disinfectant) (Chapter 3); facility, integration, installation and construction services (Chapter 4); sanitation services within the sanitation service chain (SSC) (Chapter 5); and sanitation-biomass transformation enterprises (Chapter 6) that use the biomass generated from the sanitation service chain (SSC) for safe recovery of water, nutrients, organic matter and energy which are finally delivered to customers (Koottatep *et al.*, 2019); SVC as a market-based approach where value is added at different stages of the sanitation sector including marketing (Chapter 7); advocacy for policy and behaviour change (Chapter 8); and sanitation management knowledge (Chapter 9) to deliver innovative and fit-for-purpose products and services. Thus, the sanitation value chain depicts how customers' value can accumulate along the chain of activities that lead to an end-product or service (Koottatep *et al.*, 2019).

The expansive transformation of the SVC has the capacity to address the current global sanitation backlog, estimated at 2.3 billion people without access to any sort of improved sanitation facility and 4.5 billion – more than half the world’s population – that still lack access to safely managed sanitation (TBC, 2019a). These concerns and the need to shift the SVC from an initial focus on product/service design/development and follow Regenerative Sanitation (ReGenSan) principles are the reasons why an integrated-functional version of the SVC was proposed by Koottatep *et al.* (2019) and is expanded in this publication: an integrated functional sanitation value chain (IFSVC).

## 1.2 PORTER’S VALUE CHAIN MODEL

This concept was introduced by Michael Porter of Harvard Business School and has gained wide popularity for understanding the fundamentals of any development business (McLeod, 2012). Porter (1985) viewed the organization as a chain or series of processes that each add value to the products and/or services for the customer. Thus, the framework promotes firm competitiveness by directing attention to the entire system of activities involved in producing and consuming a product (Inomata, 2017). Porter (1985) considering competitive advantage has used the value chain framework to assess how a firm should position itself in the market and in the relationship with suppliers, buyers and competitors. The idea of the competitiveness of an enterprise can be summarized as follows: how a firm provides customers with a product or service of equivalent value compared with competitors, but at lower cost; or alternatively, how the enterprise can produce a product or service that customers are willing to pay a higher price for (M4P, 2008). This provides a tool that firms can use to determine their source of competitive advantage, as Porter argued that the source of competitive advantage cannot be detected merely by looking at the firm as a whole; rather the firm should be broken down into series of activities where competitive advantages could be found in one or more of the activities (M4P, 2008; Porter, 1985, 2008). Porter’s Value Chain Model defines the value chain into two distinct types of activities (see Figure 1.2):

- (1) Primary activities which include inbound logistics (getting materials in for adding value by processing it); operations (which are all the processes within the manufacturing); outbound logistics (distribution to the points of sale);

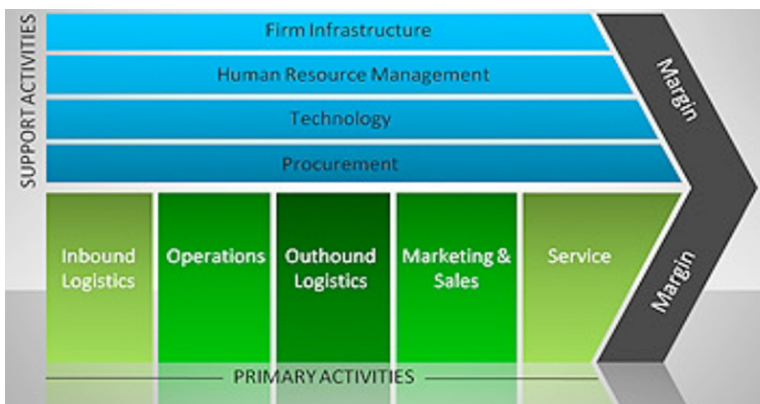


Figure 1.2 Porter’s value chain competitive advantage (Porter, 1985, 2008). (image credit: Michael porter)

marketing and sales (selling, branding and promoting); and service (maintaining the functionality of the product, post sale) (Porter, 1985, 2008).

- (2) Support activities that feed into all the primary activities, such as the firm infrastructure, human resources, procurement to buy or source goods at the right price and technology (Inomata, 2017; Porter, 1985, 2008).

Porter (1985) argues that a company's business is best described as value change. Managers can win the competition by targeting elements of the value chain through their company for specific purposes (Sutarmin, 2016).

A company's value chain activities make up part of a larger stream of activities in an industrial sector, which Porter referred to as a value system; either upstream (i.e. suppliers) and/or downstream (i.e. distribution system). This includes the suppliers that feed the companies with the input materials used to create and produce/provide products and services and the network of organizations that interact to meet the demand of the market and customer (Porter, 1985, 1990, 2008).

### 1.3 GLOBAL VALUE CHAIN AND/OR NETWORK APPROACH

More recently the concept of value chains has been applied to the analysis of globalization (Kaplinsky, 2000, 2002; Kaplinsky & Morris, 2001; Springer-Heinze, 2018a, 2018b), using the framework of the value chain to examine the ways in which firms and countries are globally integrated to assess the determinants of global income distribution (M4P, 2008). By mapping the range of activities along the chain, a value chain analysis breaks down the total value chain earnings into the rewards that are achieved by different parties in the chain. This approach can also show how firms, regions and countries are linked to the global economy, especially in the case of sanitation, where the critical products and services are not produced in most developing countries where SDG 6 targets are not being met. SVC may be national, regional, or global, depending on the goods and services in question, as activities may take place in several parts of a country, regions, different countries and on different continents, although some cases may be more limited, involving only a few locations within country across the globe (Springer-Heinze, 2018a, 2018b). For instance, world ceramic sanitaryware production sources raw materials from several countries while the factories or industries are located in different countries and the products are distributed and marketed all over the world (see chapter 3). The 'value network' and/or 'integrated functional' approach extends the idea of the value chain to social networks and views enterprises as being embedded in a complex of horizontal and vertical situations involving multiple players and where processes are not actually linear (McLeod, 2012; Trienekens, 2011).

The SVC incorporates business models for toilet provision, products and services, re-usable water and nutrients, data and information and is designed to provide new benefits across the economy and society (Akinsete *et al.*, 2019). Thus, the SVC can be defined as a socioeconomic system that includes all enterprises cooperating to serve the sanitation market. The enterprises forming the SVC interact constantly – buying and selling products and services, exchanging information, supporting each other, and cooperating to pursue shared interests (Springer-Heinze, 2018a; Trienekens, 2011). These enterprises are the core of a wider value chain community that consists of private associations, specialized service providers and industry-specific public organizations that provide support. In essence, improving the value chain builds on collaborations between partners in the sanitation industry at large (Springer-Heinze, 2018a). The network of value chains includes market outlets from local, regional, national and international situations that focus on vertical and horizontal relationships (formalizing business linkages through written agreement and contracts) between actors in the chain (Trienekens, 2011).

### 1.4 RELATIONSHIP BETWEEN THE SANITATION ECONOMY AND VALUE CHAINS

Integrating the sanitation economy with value chain systems presents vast potential for global economic growth and has the ability to transform businesses. The integrated functional sanitation value chain (IFSVC) system brings together all the designers, producers, processors, buyers/users and sellers in integrated-systemic functional networks and/or chains that add value to goods and services as they pass from actors along the spectrum of conception to the final consumers which include knowledge management and advocacy actors in the sanitation economy. This is excellently captured by the concept of the sanitation economy as postulated by the Toilet Board Coalition (TBC) as a ‘robust marketplace of products and services, renewable resource flows, data and information that could transform cities, communities, and businesses. It creates a new trajectory for sanitation management by addressing it as a ‘solution provider for sectors and governments facing constraints on essential resources such as water, nutrients, energy and proteins’ that could also provide insightful and innovative data for public health and consumer behaviour and the invention of integrated and novel solutions and technologies for all-round sanitation systems (see Figure 1.3). In addition, it provides another option for tackling sanitation challenges and its impact on other SDGs and socioecological systems by translating global sanitation needs into sustainable business solutions with outstanding value of multi-billion dollars a year in the marketplace (TBC, 2019a). The sanitation market, where transactions and trade of sanitation products and services take place, consists of three interconnecting sections as described below.

- **The Toilet Economy:** this encompasses both the products and services that provide safe toilet access and maintenance (as well as related products/services) for all at both private and public levels across centralized and decentralized and/or

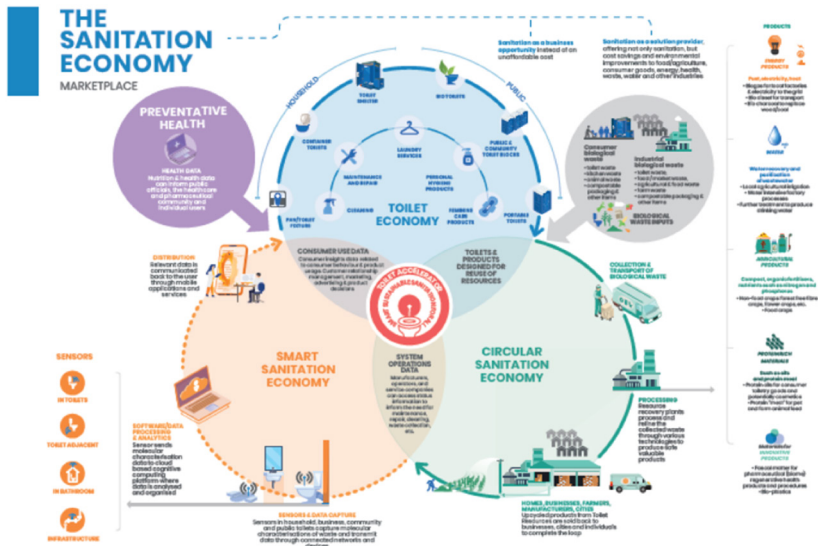


Figure 1.3 Illustration of sanitation economy (Source: Toilet Board Coalition, 2019a, 2019b).



sewered and non-sewered systems within contexts of high and low water tables, high and low income, as well as rural, urban and peri-urban areas (e.g. household toilets, community toilets, public toilets, auxiliary products). Also, there are a variety of sanitation solutions, both dry and wet, such as full waterborne systems, septic tanks, biodigesters, container-based systems, pit and improved ventilated pit latrines, and composting toilets. These systems operate differently according to resources required, energy used, and most importantly how the waste produced is processed (Frost & Sullivan, 2021). Resources are collected from these systems and are used to add value in the Circular Sanitation Economy, while data about consumer usage are captured by the Smart Sanitation Economy to provide knowledge for users, operators, and other businesses, which could be used to improve user experience, operating efficiency, and range of potential products and services (Frost & Sullivan, 2021). Also, institutions across the globe have 'reinvented' the toilet and produced a variety of alternatives to the conventional flush toilet that many of use today. New innovative systems have been developed to use less or zero water, to be more energy efficient, and if waste is produced, to be treated and reused or transformed into products such as fertilizer. These solutions can provide full on-site sanitation solutions that include generation and containment, as well as treatment of waste in areas without access to sewer systems and water supplies; and they can bring sanitation to the world's poorest communities and contribute to the sustainable development goals (Frost & Sullivan, 2021).

- **The Circular Sanitation Economy:** this alternative to a linear economy is one in which resources are reused as much as possible to minimize the generation of waste. The aim is to maximise the value that can be extracted from them during their lifetime and the products or materials are recovered or regenerated at the end of their lifecycle (Frost & Sullivan, 2021). The circular sanitation bioeconomy moves away from the traditional waste management view of human waste as having no value; that is toilet resources (i.e. human waste and perhaps farm animals' too) are recovered, recycled and reused to produce other organic products, often in combination with solid waste within and around a circular bioeconomy system. Nutrients, water and other matter are recovered and treated as sanitation resources to create value-adding products (e.g. biogas, electricity, biochar, organic fertilisers, proteins, animal feed, etc).
- **The Smart Sanitation Economy:** this will be present in smart cities where the sanitation system is digitized. In this economy, data of consumers and service providers are collected to monitor, improve and maintain systems within the sanitation economy. This includes collecting data on consumer health, the usage of public toilets, and sewage treatment facilities (Frost & Sullivan, 2021). For example, sanitation intelligence is provided by gathering data and information through technologies that capture usage, sewage treatment, health indicators, maintenance and repair systems to produce knowledge for informed decisions by governments, businesses, citizens and other stakeholders (e.g. health data, smart technologies, smart logistics, data analytics and applications) (Akinsete *et al.*, 2019; TBC, 2019b). A sanitation economy with a re-designed SVC presents vast potential for global economy growth while addressing one of the most urgent major challenges of our time, achieving universal access to improved safely managed sanitation (SDG6). It monetizes toilet provision, products and services, biological resources, data and information to provide benefits across the economy and society (Akinsete *et al.*, 2019).

### 1.5 INTEGRATED FUNCTIONAL SANITATION VALUE CHAIN (IFSVC)

Value chain integration is a process by which multiple enterprises within a shared market segment of the sanitation sector collaboratively loosely to tightly plan, implement and manage the flow of goods, services and information along the value system in a way that increases customer value and optimizes the efficiency of the chain (Dobbs, 1998; Papazoglou *et al.*, 2002). The integration shows the ‘extended enterprises’ that are creating and enhancing customers-perceived value by means of cross-enterprise collaboration (Papazoglou *et al.*, 2002). On the other hand, ‘functional integration’ aims at more efficient linkages of elements in the sanitation supply chain, namely to ensure that suppliers closely meet the requirements of customers in terms of costs, availability, and time (Rodrigue, 2006). Thus, ‘integrated-functional’ complementarity is established through a set of supply/demand relationships involving physical and information flows among the value chain actors and stakeholders, thereby ensuring that efficiencies and economies are achieved through the principles of flow (Rodrigue, 2006). Since sanitation activities are not necessarily locked inside a single organization (or even a business unit within an organization), but are more of a large-scale set of interactions between players in multiple industries, companies and/or countries, the sequence of value-adding activities is not particularly linear or constrained within a given sequence.

The value chain ‘network’ and/or ‘integrated functional’ system differs from the Porter value-chain concept by shifting the focus from firms to the configuration of business activities (Inomata, 2017). Thus, a corporate entity is first decomposed into a set of businesses with individual functions that constitute analytical units (business activities) – such as product design, materials procurement, material marketing and distribution – that tend to be defined in a way to pursue the individual objective of that particular unit, which may or may not conflict with the objective of other units. This implies that all activities in the value chain are collectively organized to ensure optimization of the functioning of the corporate entity as a whole (Inomata, 2017; Porter, 1985). The IFSVC is then conceptualized as production and service networks of horizontally and vertically related enterprises and/or businesses loosely or/and tightly joined together locally, regionally, nationally and internationally with the aim of working towards providing products or services to the sanitation market (Trienekens, 2011).

This IFSVC concept focuses on the operational functions within the sanitation sector in combination with sanitation enterprise operators, external actors such as supporters of the sector (professional associations, communities of practice, etc.) that provide support to the growth of the SVC, and enablers that govern and regulate (government) SVC activities (Koottatep *et al.*, 2019; Springer-Heinze, 2018a, 2018b). It expands the sanitation value chain activities beyond the SSC and ensures comprehensive and integrated-functional solutions by taking the total system approach of the sanitation economy, which fundamentally realigns flows of products, services and information as well as recovery of nutrients, water, energy, data, and finance within the economy; acting as a root cause solution for a number of areas beyond sanitation itself (Akinsete *et al.*, 2019). The IFSVC pre-supposes that the SVC (and sanitation economy) cannot be effective unless all stages are working connectively in an integrated synergistic systemic manner (Koottatep *et al.*, 2019) across local, regional and international arenas focusing on vertical and horizontal relationships between actors (Trienekens, 2011). Traditional value chains are linear processes, where upstream suppliers provide material for products or services, and downstream units provide distribution and point of sale (Chofreh *et al.*, 2019; Reese *et al.*, 2016). However, the IFSVC is a non-linear system that links all enterprises, businesses and actors across the sanitation spectrum from local, regional, national and international systems involved in adding value to each stage of



the sanitation value chain until the products and/or services reach the hands of the end-users.

The value chain is made up of eight main value-chain stages (product design and development; manufacturing services; facility integration; installation and construction; sanitation services; sanitation biomass recovery; marketplace and sales; sanitation advocacy and sanitation management knowledge) as well as governance and business enabling systems that link in a closed loop and represent the ‘enterprisation’ of the entire sanitation sector, including the SSC. This implies that the IFSVC explores all enterprises, ventures and activities within the whole system by identifying the functional linkages within a systemic loop that captures the various operations and different stages related to sanitation management from conceptualization to the final market, as well as the enterprises and ventures within each stage. In short, value-added activities within each stage and the way the stages link to each other through enterprise interactions depict the integrated functional value chain system. Also, added value is created at different stages and by different actors throughout the IFSVC. The value added may be related to quality, cost, delivery times, delivery flexibility, innovation, and so on. (Trienekens, 2011), while the size of the value added is decided by the end-customer’s willingness to pay. Opportunity for an enterprise to add value depends on a number of factors, such as market characteristics (size and diversity of market) and technological capabilities of the actors (Kaplinsky, 2000).

All the stages are anchored (throughout the chain) by the supporting and enabling structures and mechanisms (Koottatep et al., 2019), see Figure 1.4, and must be closely interconnected.

Details of the stages are provided below:

- (I) *Product design and development* – the initial stage of planning and conceptualization of sanitation products and services
- (II) *Manufacturing* – the stage of primary and secondary production of user products, supply and distribution to the market and service delivery such as toilet combo, faucets, pipes, and so on.
- (III) *Facility integration, installation and construction* – the stage of installation, construction, connection, operation and fabrication of sanitation facilities at point of use (such as septic tanks, public toilets, treatment facilities, pipe-laying, etc).

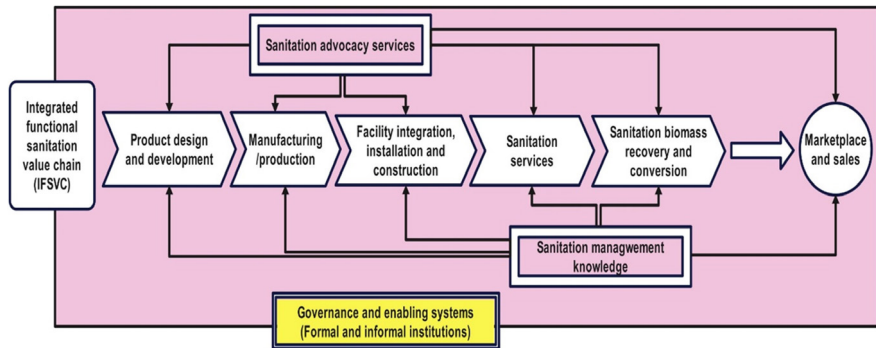


Figure 1.4 Nine stages of the integrated functional sanitation value chain (Source: authors).

- (IV) *Sanitation services* – the stage of activities after the user interface from collection to disposal and/or treatment (such as emptying, transportation, disposal, etc.)
- (V) *Sanitation biomass recovery* – the recovery of organic nutrients, biogas, manure by various processes and their transformation for broader applications through the utilization of changed products for other purposes such as agriculture, aquaculture, horticulture, and so on.
- (VI) *Marketplace and sales* – the final market for all products and services as well as the sanitation materials obtained from the recovery and transformation processes. The major markets for sanitation products and services include (but are not limited to): the healthcare industry, transportation industry (air, land, water), rural and urban households, hospitality industry, agro- and allied industries, educational industry, businesses providing access to safely managed sanitation for their employees, across supply chains and in communities where they operate, and so on. The market provides feedback to the designers and developers at the conceptualization stage for appropriate, acceptable and marketable products/services and innovations
- (VII) *Sanitation advocacy* – building a critical mass of people to support a common cause by creating high social impact with a sizable market for sanitation products and services
- (VIII) *Sanitation management knowledge* – this involves managing knowledge sourcing, acquisition, creation, transformation, dissemination and usage as a key to developing innovations and competitive advantage as value is added to or created by available knowledge capital/assets to produce improved performance, capabilities and competences in individuals, organisations and industrial sectors
- (IX) *Governance and enabling systems* – enhancing and regulating services to all the operators in the value chain. Typical support services include setting of professional standards; provision of information; trade fairs and export marketing; research on generally applicable technical solutions; professional, vocational training or political advocacy. These services are often provided by business associations, chambers of commerce or by specialized public institutions. Typical enabling services are provided by relevant government institutions, major providers of public utilities, educational and research institutions, civil societies and intervention organizations, governance and regulatory services of the value chain.

The sanitation economy is dependent on the value-added activities across all stages of the IFSVC. To this effect, the IFSVC identifies the functional linkages that capture all the business activities at different stages in the sanitation economy (Koottatep *et al.*, 2019), as shown in Table 1.1, and also describes the socio-economic reality of the sanitation sector.

All chain actors, private enterprises in particular, need to understand the value chain they are a part of, its functioning and failure, and their own position in it. The results are used to prepare decisions on objectives and strategies (Springer-Heinze, 2018a). Sanitation enterprises can develop a vision of change and determine collaborative strategies based on a shared view on the state of the value change (Springer-Heinze, 2018a). Government and public actors could use analysis of the IFSVC to identify and plan supportive actions and monitor impacts of their policies on the value-chain players.

**Table 1.1** Integrated functional sanitation value chain (IFSVC) activities and processes.

<b>Stages</b>	<b>Enterprises/businesses</b>
Product design and development services	Research and development, education and training institutes, wastewater treatment plant designers, home, commercial and toilets/accessories designers, architectural and interior designers, sanitary engineering consultants, sanitary wares and accessories designers, recovery, recycling and reuse system designers, town and urban planners, public and environmental health consultants, and so on.
Manufacturing services	Sanitary wares and accessories, treatment plant/accessories, toilets/accessories, recovery, recycling and reuse accessories, cement manufacturers, importers, suppliers, retailers, distributors, plumbing materials/ accessories, cleaning and hygiene products, metal, cements and wood work, suppliers/distributors, and so on.
Facility integration, installation and construction services	Fabrication and installation, logistics and transportation, architecture and real estate, sanitary engineering, town and urban planners, wastewater treatment plant installation, faecal and sewage sludge treatment plant installation, recovery, recycling and reuse, home and commercial building toilet installation, plumbing and cement works, public and mobile toilet installation, microenterprise services, sales, installation and construction, local mason, metal, woodwork and concrete building contractors, testing and quality control laboratories, and so on.
Sanitation service	Logistics and transportation, wastewater treatment plant operations and maintenance, faecal and sewage sludge collection, emptying and treatment, public and private utilities, environment and public health consultants, operations and maintenance, sanitary engineering, town and urban planners, cleaning and hygiene, testing and quality control laboratories, public, home, commercial building, mobile, toilet maintenance, plumbers, local artisan and masons, education, training and capacity development, and so on.
Sanitation biomass recovery services	Resource recycling and recovery, composting and organic matter recovery, wastewater resource recovery, faecal and sewage sludge treatment recovery, public and private utilities, certification and verification, health, safety, quality control and assurance, training/capacity building and so on., Also, organic fertilizers and manure, recycled water suppliers, biogas and energy producers and suppliers, aquaculture, horticulture, animal feeds producers, parks and gardens management, farmers' cooperative organizations, aquaculture cooperative organizations, certification and verification, health, safety, quality control and assurance, and so on.
Marketplace and sales	This is where demand meets supply, where buyers or customers meet suppliers and a transaction related to sanitation provision takes place. This is conducted by the sanitation enterprise (or in some cases a public utility) which arranges for promotion, production, distribution, sale, and delivery of the goods or services through its operations.
Sanitation advocacy services	These are enterprises involves in public education and influencing public opinion; research for interpreting problems and suggesting preferred solutions; constituents' actions and public mobilization; agenda setting and policy design; lobbying; policy implementation, monitoring, and feedback, and so on.
Sanitation management knowledge services	This is concerned with the generation, capture, storage and sharing of knowledge with an intent to take timely actions for increasing competitive advantage
Governance and enabling systems	Policy, legislators, regulators, guidelines and standards developers, land-use planning, sustainable financing, investors and banks, policymakers, and so on. Also, includes: ministries/departments/agencies responsible for environment, health, water resources, economic planning and cooperatives, natural resources, agriculture, fisheries and aquaculture, trade, commerce, industry, gender and development, education, information and communication, financial and insurance institutions, public and private investors, marketing and advertising, multilateral organizations, research community, international, regional, national and local non-governmental organizations, community-based organizations, and so on.

## 1.6 VALUE CHAIN ANALYSIS

Mapping the IFSVC will stand as the initial process in analysing the value chain so as to identify the main supportive business activities, and all related components and the relationships between them (Chofreh *et al.*, 2019). This will not only provide an overview of the system by identifying the position of value-chain actors but could also help to visualize key topics for the value-chain analysis and then structure the information according to the functions and stages of the chain. A mapping like this will reduce the complexity of economic reality into a comprehensive visual model (Springer-Heinze, 2018a, 2018b), see Figure 1.5.

The value-chain map can be characterized by eight generic elements of which five constitute the basic value chain maps: (i) marketed products/services or group of products/services that define the value chain, (ii) an end market in which the products/services are sold to customers, (iii) a series of value-chain stages through which the products/services reach the end market, (iv) enterprises or chain operators conducting the business operations, (v) business linkages between these operators, (vi) selected business linkages with sub-contractors and operational service providers, (vii) support service providers, and (viii) public agencies performing regulatory functions (Springer-Heinze, 2018a).

The basic value-chain map shows the micro level of the value chain, that is the value chain stages, the different types of operators and their relation to the end market. The value-chain operators are the owners of the merchandise along the chain. They buy the main raw materials, perform the productive/creative process and pass on the semi-finished and final commodities to the consumers in the end market. It is important to note that business linkages in the value-chain map always refer to the interactions between the value-chain operators (Springer-Heinze, 2018a).

Also, the concept of business models occupies a key role in the value chain analysis. To define a specific type of operator in the value chain map, analysts look for its business

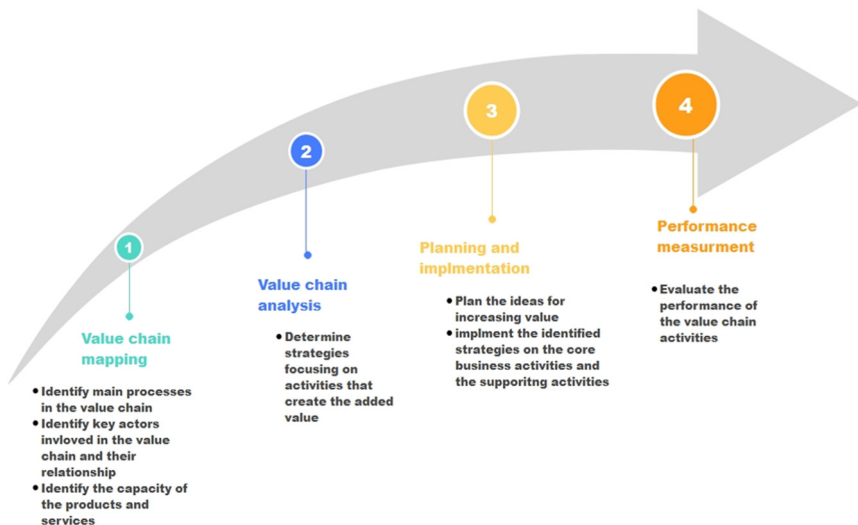


Figure 1.5 Steps in a value chain analysis (Source: Authors).

model. For instance, enterprises of similar sizes and with similar business models are grouped together, while enterprises that have a business model in common are classified as a particular category of operator. The business models of the operators constitute the backbone of the value-chain map (Springer-Heinze, 2018b). The methodology combines analytical and procedural aspects and could be structural, economic, environmental, social and poverty analyses:

- (I) The structural analysis involves mapping, which is a visual representation of the value chain system. Value chain maps identify products and end markets, business operations (functions), chain operators, and their linkages, as well as the chain supporters. The basic value chain map is a descriptive conceptual model. The value chain mapping is most essential to the chain and is the core of any value chain analysis (Springer-Heinze, 2018a, 2018b).
- (II) Economic analysis indicates market prices, quantifying the volume of product and the market shares of particular segments in the chain. The data are used to determine the value added along the stages and chain competitiveness which include cost of production and marketing (Springer-Heinze, 2018a, 2018b).
- (III) The environmental analysis determines the impact of sanitation systems on the ecosystems, natural resource and climate change as well as the contribution of IFSVC's of sanitation biomass recovery and sanitation services to the circular bioeconomy. The main tool is the construction of an impact matrix that allows identifying impacts of the chain on the environment (Springer-Heinze, 2018a, 2018b).
- (IV) The social and poverty analysis focus on the vulnerable groups that do not have access to safely managed sanitation services and how the chain can use to provide these essential services to the poor of the society (Springer-Heinze, 2018a, 2018b; Sutarmin, 2016).

In conclusion, this book explores concepts, frameworks, principles and practical case studies that support and represent an *integrated functional sanitation value chain (IFSVC)*. Authors and contributors identified and examined practical and operative linkages within a systemic loop that capture various functions at different stages of activities within different enterprises, and production/service processes related to sanitation management and economy from design and production to final market and user. We also explored enterprises and ventures within each stage as well as those businesses directly and indirectly involved with providing safely managed sanitation services and ancillary businesses across the global supply chain (in the particular communities where they operate).

The intention is to direct thinking towards building an expansive *IFSVC* that could give birth to a sanitation economy. The contributors to this book connected the missing links between the *IFSVC* and the sanitation economy, thus providing a new lens with which to translate global sanitation needs into sustainable business solutions. The book showcases up-to-date research findings to support the concepts, frameworks, and principles presented therein, and also relevant cases that highlight leading sanitation and related business, education and research organizations, as well as global supply chain ventures involved in the provision of safely managed sanitation products, services and facilities, and do so from the *IFSVC* perspective. Consequently, the concept of the *IFSVC* should enable academicians, professionals, practitioners, businesses and entrepreneurs to see mixed economic, environmental and social gains not realized by traditional sanitation value chain considerations, thus bringing a much wider range of companies and other stakeholders into active engagement with sanitation systems and services. With this approach sanitation can also provide a solution for water security, energy

security, food security and healthcare. The book also intends to create academic interest in exploring and describing the IFSVC as well as research studies into the IFSVC that could be operating within local, regional, national and global sanitation management and economic settings.

### 1.7 Take Action

- (I) Take an inventory of sanitation and related enterprises in your city and show how they interact with others, if they do.
- (II) Develop promotional materials for IFSVC in your city, town and municipality to inform others about the need to develop and/or strengthen IFSVC; and send out to sanitation-related professional bodies and chambers of commerce.
- (III) Organize an event to bring together sanitation businesses/enterprises and other stakeholders to discuss the existing sanitation value chain (SVC) and how to upgrade and develop it to the IFSVC.

### 1.8 Journal Entry

- (I) Make a table indicating the different activities of the IFSVC and related players in your own area.
- (II) What is the sanitation value chain and how is it relevant to SDGs 1, 6, 9, 11, 12, 2, 3, and 7?

### 1.9 Reflection

- (I) Write a short essay on understanding the agricultural value chain, how it operates and how this knowledge could be used to create and/or upgrade existing SVCs.

### 1.10 Guiding Questions

- (I) What does it mean to reconceptualize the sanitation value chain and why is it necessary?
- (II) What was the gap in previous perspectives of using the sanitation service chain (SSC) alone to represent the sanitation value chain?
- (III) What is the relationship between the sanitation economy and the integrated functional sanitation value chain (IFSVC)?
- (IV) How does Porter's value chain differ from the integrated functional sanitation value chain (IFSVC)?
- (V) How can the integrated functional sanitation value chain (IFSVC) be described?



- (VI) Who are the actors that participate in the IFSVC? What functions do they perform? How many exist within the chain?
- (VII) What are the factors that determine the capacity of an enterprise to add value in the IFSVC?
- (VIII) With the aid of a diagram, give a detailed description of the value chain stages of the IFSVC.
- (IX) What is IFSVC mapping and analysis? What information does it provide and what is the usefulness of such data?

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