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SUPPORTING DEMAND ACTIVATION

Decision Support Tool User Guide

FSG

TETRA TECH

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GLOSSARY

Control panel	A table in the user dashboard of the model that allows the user to vary the value of key variables that determine the outputs of the model. The values entered in the control panel lead to real-time changes in the output tables in the model
Commission	A monetary incentive paid to a demand activator by the sanitation entrepreneur for every sale generated by him/ her. This amount can either be a fixed value or a percentage of the toilet sales price
Dashboard	A dashboard is a user interface that consolidates, organizes, and presents information in a way that is easy to read. The dashboard has two parts: a control panel that allows the user to select/ input the parameters of the model; and a table that displays the resultant outputs on the same sheet
Demand activator	Independent agents who, in exchange for a commission, carry out direct sales and marketing activities to persuade customers to convert product awareness and interest into a purchasing decision. Selling toilets is only a part-time activity for these agents, and they are also engaged in other income-generating activities
Demand activators required	The number of demand activators required to fully cover the target geography based on the ratio of demand activator to geography defined in the "General inputs" sheet
Demand activators recruited	The number of demand activators (DAs) actually engaged keeping in mind that there will be attrition; i.e., some of the engaged demand activators will stop selling toilets permanently. The number of demand activators recruited is higher than the number required ensuring that after drop out, the required number of demand activators remains. It is assumed that during the policy period (see below) the government will recruit DAs, after which either the entrepreneur will recruit them or they will self-select to become DAs
Demand activator with average sales	Demand activators (DAs) who see slowly rising month-on-month sales initially, and then have fairly consistent sales but within a range that is lower than the minimum sales threshold required to earn the minimum expected income
Demand activator with poor sales	Demand activators (DAs) who never consistently engaged in selling and ultimately act as opportunistic players who sell toilets whenever there is increased demand
Demand activator with stable sales	Demand activators (DAs) who see increasing sales month-on-month until sales plateau at a level that is above the minimum sales threshold needed to earn the minimum expected income
Direct toilet sales	The total number of toilets sold by those demand activators to whom the government provided top-up support. Direct sales do not include sales generated by demand activators post withdrawal of government support and sales generated by demand activators that do not require government support
Drop out	The number of demand activators who stop selling toilets after being recruited. The drop out is calculated based on an attrition rate defined in the "General inputs" sheet. Note demand activators with sporadic sales (see poor sales above) are not considered to have dropped out

Duration of support	The number of months for which the government provides demand activators with top-up support (as defined below) also called policy duration (see below)
Indirect toilet sales	The total number of toilets sold by those demand activators who do not require the government provided 'top-up' support or sold toilets post withdrawal of government support
Expected monthly income	The total amount a potential demand activator expects to earn a month after taking into account all the income-generating activities he/ she is engaged in
Key variables	A key variable is one that has a direct and significant impact on the output of the model. These could include the choice of housing segment targeted by the policy lever; the key constraints faced by house owners; and factors influencing compliance with the policy
Minimum expected income	The minimum monthly income expected from selling toilets below which an individual will not be willing to become a demand activator. The minimum expected income is calculated by multiplying the individuals expected income by the percentage of time the individual will spend selling toilets as opposed to other income-generating activities
Minimum sales threshold	The number of toilets a demand activator needs to sell in a month in order to reach the minimum expected income. This is calculated by dividing the minimum expected income by the commission received per toilet sale
Model period	The total duration (in months) that the base model supports. The model has been built keeping a 36 month (3 year) period in mind. The policy period (see below) can be altered to cover all or part of this model period
Policy period	The maximum duration, in months, that the government provides top-up support to demand activators
Sales trajectory	The estimated number of toilets a demand activator will sell month-on-month
Sanitation entrepreneur	An individual who manages an enterprise that provides sanitation products and services to customers in exchange for a fee. In this workbook the sanitation entrepreneurs are the agents selling toilets, engaging demand activators to generate sales, and paying the demand activators a commission per sale generated
Top-up support	The monetary support given to demand activators by the government to ensure that they stay engaged in selling toilets. It is the difference between the demand activator's minimum expected income per month and the actual income he/ she earns per month from toilet sales
Total sales	The total number of toilets sold over the model period (see below) by all demand activators engaged as a result of the policy lever (less the drop outs)
User	In this document, user refers to someone who wishes to apply the demand activation model to a specific geography/ market and is therefore interested in adapting it

1.0 INTRODUCTION

Inadequate access to sanitation remains a significant problem globally. According to the Joint Monitoring Programme (2020), 1.7 billion people still do not have access to basic sanitation facilities, while 494 million people still practice open defecation. Inadequate sanitation is linked to the transmission of numerous communicable diseases—particularly cholera, dysentery, hepatitis A, typhoid, and polio—with a disproportionally large effect on children. The scale of investment required to deliver sanitation goods and services to the hundreds of millions of people around the world that currently lack access is staggering and beyond the capacity of public finance alone.

The private sector has already proven itself a key player in the financing, construction, and operation of municipal water supply and wastewater systems in both developed and developing world settings, and has a significant role to play in the provision of onsite sanitation. Experts increasingly view market-based sanitation (MBS) interventions—through which private sector actors supply toilets and related services to individual households—as a promising approach for scaling the delivery of onsite sanitation to households that are not connected to centralized wastewater collection and conveyance systems. Successful MBS interventions in Southeast Asia and Bangladesh demonstrate the promise of this approach, yet those successes have proven difficult to replicate in other regions, particularly sub-Saharan Africa and India, where the need is greatest.

Water, Sanitation, and Hygiene Partnerships and Learning for Sustainability (WASHPaLS) is a USAID centrally funded research and technical assistance mechanism that focuses on identifying and filling gaps in knowledge concerning behavior change and sanitation product and service delivery. One of WASHPaLS's first tasks was to produce and disseminate an in-depth desk review report on market-based approaches to sanitation. With an overarching aim to illustrate how and when an MBS approach may best work within a given context, the desk review describes the current state of knowledge in market-based sanitation (MBS) and establishes a framework to analyze, design, and improves MBS interventions. It is based on a survey of approximately 600 documents on MBS, in-depth research into 13 MBS intervention case studies across the global south, and interviews with sector experts and program personnel.

The survey of the MBS literature and analysis of case studies made clear that, while the focus of these interventions tended to be the sanitation *market*[1] (the interaction between buyers and sellers), successful interventions also sought to bring about change in the broader sanitation *market system*[2] (e.g., value chains and such supporting functions like banking and infrastructure). In an effort to apply this *systems* lens to MBS, a "framework" for MBS interventions was developed that specifies the various levels at which stakeholders should intervene to bring about systems change.

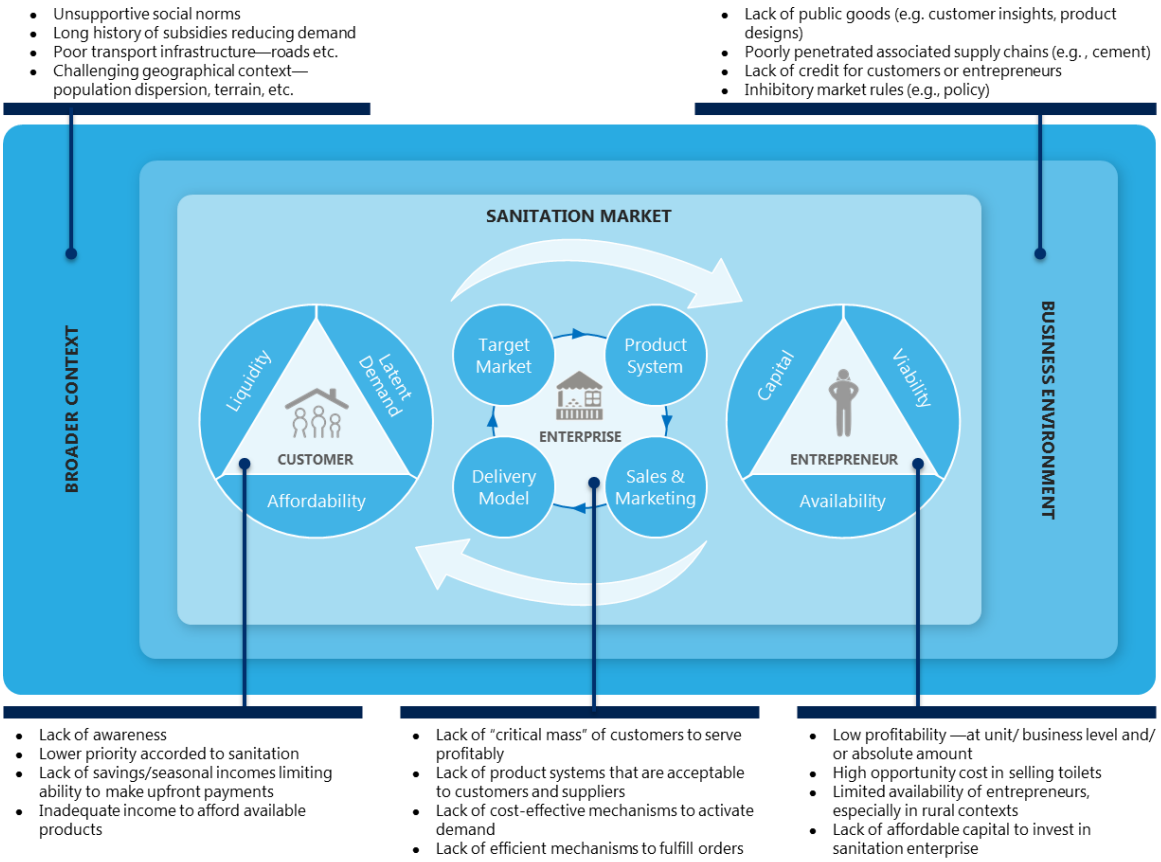
The framework specifies three distinct domains of the sanitation market system, based on degree of influence in each domain from an intervener's (funder and implementer) perspective: **context**, which

[1] According to the Making Markets Work for the Poor (M4P) approach, a **Market** is "*a set of arrangements by which buyers and sellers are in contact to exchange goods or services; the interaction of demand and supply.*" Alternatively, a market comprises buyers and sellers. In the above figure the market is represented by the customer, the sanitation enterprise, and the entrepreneur

[2] A **Market System**, meanwhile, is "*a multi-function, multi-player arrangement comprising the core function of exchange by which goods and services are delivered **and** the supporting functions and rules which are performed and shaped by a variety of market players.*" A market system therefore comprises value chains and supporting functions (e.g., banking system, infrastructure) that enable the market to function. The market system also includes formal rules (e.g., laws, standards) and informal rules or norms that influence interactions and outcomes.

interveners can understand but typically cannot influence; **business environment**, which interveners may potentially influence depending on the complexity and resources available; and the **sanitation market**, which large-scale interventions largely have the capacity to address. The existence and severity of barriers, or absence thereof, across the sanitation *market system* determines the depth of that market; see Figure 1 (USAID, 2018).

Figure 1: Barriers to scaling MBS across the sanitation market system



At the center of the framework is the **sanitation market**, with the business– the mechanism that facilitates the exchange of products and services between entrepreneur and customer, also known as the "**sanitation enterprise**," at its core. Sanitation enterprises must attract enough customers (a "critical mass") to operate profitably. At the same time, entrepreneurs with the attributes (e.g., skills, assets) and capital necessary to build or sell toilets are needed.

Both customers and entrepreneurs may be confronted with a distinct set of barriers, which, individually or in combination, hinder their participation in the market. Customers may lack income or savings to afford toilets that are available in the market (the "affordability" barrier); they may have unstable or seasonal income that prevents them from making the full payment upfront ("liquidity" barrier); or they may not be willing to pay for toilets that are affordable for a range of reasons ("willingness" barrier). On the supply side, the availability of entrepreneurs with attributes (e.g., skills, assets) necessary to build or sell toilets may be limited (the "availability" barrier). Low profitability of selling toilets may discourage entrepreneurs from entering or continuing to operate in the market (the "viability" barrier), or entrepreneurs may lack the capital required to invest in the sanitation enterprise (the "capital" barrier).

The functioning of a sanitation market is governed by the broader **business environment**. The business environment is shaped by factors such as the availability of non-excludable public goods (e.g., market information on product designs in the public domain); the state of associated supply chains (e.g., availability and price of construction raw materials used to build toilets); the state of financial services, which affects the availability of credit for customers and entrepreneurs; and **market rules**, i.e., business-related laws, regulations, and policies (e.g., government programs to provide in-kind hardware subsidies).

Finally, social norms or informal rules can be as powerful as market rules, or even more. Context, beyond the commercial activity related to sanitation, in our framework encompasses social norms, infrastructure, and geographical characteristics, which represents enablers or barriers that tend to shift slowly and can lie outside the influence of funders or implementers.

In order to embed and scale an MBS intervention in a given context, barriers across the three domains of the market system would need to be addressed (Figure 1). **In this document, we focus on efforts to address the barriers in the business environment; specifically the role market rules can play in creating an enabling environment for MBS interventions.**

Market rules include taxes and tariffs, laws, regulations, and policies. Shaping these to enable the sanitation market, support increasing demand and/or improve enterprise viability, is the role of the government at all levels—national, regional, and local levels (Pedi & Jenkins, 2013).

Market rules can address various barriers to customer participation in the sanitation market, like market-compatible targeted subsidies to poor households that enhance affordability. Market rules that affect willingness to pay take numerous forms, including building codes or by-laws that authorize permits only for properties with toilets or that only release housing subsidies to those who construct toilets. Penalties through denial of service or surcharges on households without toilets also shape customers' willingness to pay. For example, water supply boards in Honduras provide new connections only to households with functioning toilets, while Uganda prohibits the sale or lease of property without toilets. Such policies, however, create challenges because they risk inequitable treatment if applied to households that cannot afford toilets. They also can be difficult to enforce, especially in the context of informal housing.

Market rule adjustments by governments to enhance the viability of the sanitation enterprise can include reducing tariffs and taxes on raw materials used for constructing toilets, providing direct support to entrepreneurs by facilitating priority access to critical raw materials, or providing entrepreneurs with assured product or service orders to institutions like schools or local government offices. For example, in Benin, the government provided incentives to local masons to set up sanitation enterprises in their villages by offering contracts to construct toilets in schools. Market rules (e.g., policy, regulation) have a significant influence on the business environment for MBS interventions since they can address physical, institutional, financial and social barriers that affect sanitation markets. While enterprises and customers must ultimately operate independently in the sanitation business environment, key actors such as the government and other stakeholders have a crucial role in shaping market rules to catalyze market activity and depth.

Governments around the world have used various financial and legislative instruments/ actions to influence market rules governing provision of social services. While there are examples of such instruments being used in the sanitation sector, there is limited evidence available regarding their efficacy. Further, even where policies are present, they are often not enforced.

The lack of evidence, or an estimate of the costs involved, makes it difficult to convince policy makers of the benefit of changing market rules. To help address this lacuna, FSG undertook targeted research on the role market rules can play in creating a positive environment for sanitation markets. **Our research attempted to answer three key questions:**

A. How do policies that support entrepreneurs in the market directly impact their viability by enhancing their ability to sell toilets, and/ or improving their profitability and market depth?

B. How do reduced tariffs/ indirect taxes impact toilet prices and consequent change in toilet sales and entrepreneur viability?

C. What is the impact of penalties on non-adoption of toilets amongst higher-income house owners who can afford, but do not have adequate sanitation facilities in their houses (either self-occupied or rented)?

Note: Henceforth, adequate sanitation may also be referred to as "toilet."

The research was carried out using an economic modeling approach. For each of the three research questions, a base economic model was created to estimate the impact of **specific policy levers** on toilet sales, and/ or viability of entrepreneurs, as well as the costs incurred by the government in enforcing the policy (e.g., loss in revenue, monitoring costs). The intention was to provide stakeholders with a tool to support decision making. That is, the models are intended to be an additional resource that policy makers, funders, and implementers can draw upon when exploring whether to introduce a particular market rule in the sanitation sector.

It should be noted, that these are economic models; not econometric models. **Economic models** are simplified descriptions of complex systems designed to simulate potential outcomes on the basis of a theory of economic behavior, existing data, and assumptions. **Econometric models** generally begin with economic models (Hymans, 2008) which are then formulated in a way that is testable (Shalab) through statistical trials. The results of these trials are compared and contrasted with the results from real-life examples. Econometric modeling requires the development of mathematical equations that can estimate the values of all variables in the economic model, as well as assumptions related to how variables outside the model may affect outcomes. In order to do this, econometric models rely on large, reliable data sets.

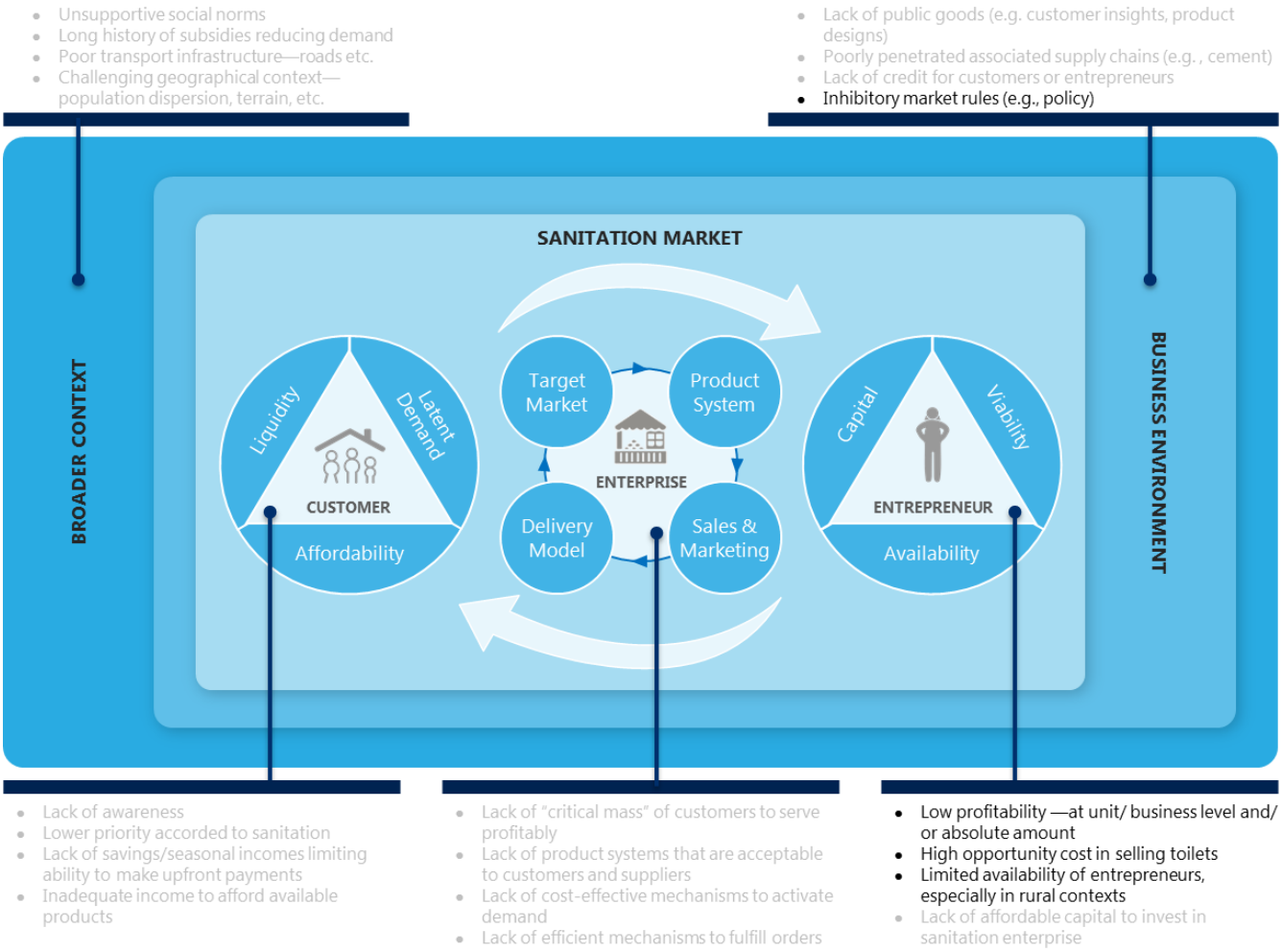
Given the limited instances of market rules being used in the sanitation sector (and the lack of data available on the outcome of these instances) creating robust econometric models would not be possible for us. Therefore, we decided upon economic modeling as the appropriate approach for our research. The model in this research generates potential outcomes using user input data, variables, and assumptions. Real-world results may vary due to variables and relationships that are unknown or not modeled in this research.

The base economic models were built using actual data from sample geographies where either similar policy levers existed, where analogous policy levers were available from other sectors, or where there was sufficient data to create hypothetical cases. Using actual data from these sample countries ensured that the models were grounded in real-world conditions, and allowed for the outputs of the model to be validated by experts from those countries. Once validated, each of the three base models was applied to an additional geography/ market to study variation in impact across different contexts. The findings from this exercise were documented in a research report. In addition, user guides were created to help stakeholders adapt these base models to other geographies/ markets.

This document is the user guide for the model created to answer Question A, i.e., how do policies that support entrepreneurs in the market directly impact their viability? **The specific policy lever that the model (hereafter referred to as the ''demand activation model') evaluates is government monetary support directed at embedding a cadre of commission agents who activate demand on behalf of sanitation entrepreneurs.** Our survey of MBS literature, and the intervention research, highlighted the importance of demand activation in increasing toilet sales. The proposed policy would ensure potential demand activators a minimum income guarantee until they reach a sales threshold at which the commissions from toilet sales equal the minimum guarantee.

Figure 2 highlights where this policy lever fits on our MBS framework. As the proposed policy lever is a market rule aimed at creating a supportive environment for MBS it addresses the "inhibitory market rules" barrier in the business environment. Further, as the policy lever attempts to increase toilet sales, it impacts the "viability barrier" faced by entrepreneurs, and therefore can reduce the opportunity cost of selling toilets, making sanitation relatively more attractive and attracting entrepreneurs to enter and stay in the market ("availability barrier").

Figure 2: MBS framework barriers addressed by the demand activation model



2.0 HOW TO USE THIS DOCUMENT

2.1 PURPOSE OF THIS DOCUMENT

This document serves as a guide to help interested stakeholders understand, adapt, and apply the demand activation model to geographies/ markets they are working in. Specifically, the document aims to provide:

- An overview of the demand activation model including the overall objectives, the decisions it can support, and its limitations
- A detailed understanding of the workings of the demand activation model including the underlying logic, expected outputs (both the benefits and costs), and key variables/ inputs
- A step-by-step guide to adapting the model for application to other markets including the contexts in which the model can be applied, and the minimum data requirements

Funders and implementers can use this document to create context-specific models and use the resultant outputs as a starting point for discussions with government officials regarding potential policy changes. Governments in turn, can use these context-specific models to support decision making.

2.2 RELATED DOCUMENTS

This user guide frequently refers to sheets in the **Demand Activation base model (WASHPaLS_Demand-Activation-Base-Model_Bihar_vf.xlsx) and should be read in conjunction with it**. Throughout the user guide, screenshots of the base model have been inserted to aid in the explanation of the model. In certain instances the same sheet has been inserted multiple times in the document in order to illustrate different points. A list of figures has been provided at the start of this document to help readers navigate through the different sections. Further, under each figure, the actual name of the sheet depicted is provided. Using this, the reader can review the relevant sheet in the accompanying base mode.

The base model was built using data from Bihar, India where an implementer (Population Services International - PSI) supported entrepreneurs by recruiting and paying commission agents to increase toilet sales. Using this intervention as inspiration, the demand activation base model estimates the increase in sanitation coverage possible through such an intervention, along with the amount it would cost the government to deliver this instead. The base model, while drawing heavily on the features of PSI's intervention, does make modifications in order to enhance the predictive power and replicability of the model. For example, attrition rates and minimum salary guarantees were introduced into the model.

2.3 INTENDED AUDIENCE

The demand activation model and this user guide are intended for use primarily by practitioners who are interested in assessing the possible impact that a similar policy lever can have on sanitation markets in a particular geography or market. Three main stakeholders are identified who may find this document useful, i.e., funders, implementers, and governments. These three groups are defined below:

1. **Governments** are the actors who have the power and the resources to change and enforce market rules. Governments operate at the national, regional and local levels, and each can have a role in ensuring the successful implementation of market rules. For example, governments set rules that determine how markets function, including regulating products and services, establishing tariff and tax rates, and incentivizing preferred behaviors and activities through subsidies and other measures

2. **Funders** are understood in this document as bilateral or multilateral aid agencies or large foundations that fund sanitation development with a willingness to intervene in markets in order to drive greater inclusion. Their strength lies in the financial and political capital that they hold. This enables them to push for changes in the larger market system to improve the business environment for market-based sanitation (MBS)
3. **Implementers** are actors who oversee the design and implementation of sanitation interventions on the ground, and have a strong local presence in the markets where they operate. They are typically supported by funders, and thus often depend on grant conditions to determine where they can intervene and in what way. For the most part, implementers of MBS are local or international NGOs, yet sub-divisions of multilateral organizations (e.g., WSP). In contrast to funders, implementers have limited scope to change market rules and prevailing norms. However, given their hands-on experience, they are often invited by governments to participate in policy forums, and can provide useful inputs into the design of market rules. Further, implementers often aid in rolling out such rules

In addition to these groups, there may be other stakeholders, such as academics, who find this document (and the associated model) useful. Researchers could find the model useful for estimating where the key sources of variability and potential for change in the market system may lie.

2.4 ORGANIZATION OF THE USER GUIDE

The user guide is organized into the following parts:

I. The first part consists of a single chapter **(Chapter 3) that provides an overview of the base model**, explaining its construct, the expected outputs, key variables/ inputs, and main assumptions

II. The second part of the user guide **(Chapters 4 and 5)** deals with how to adapt the base model for use in other markets

- **Chapter 4 takes the user step-by-step through the process** of identifying and collecting relevant input data and customizing the input sheets for a new market; explains the process of modifying the calculation sheets that covert the inputs to desired outputs; and identifies changes that may be needed in the output sheets and user dashboard
- **Chapter 5 guides the user on how to check for errors** in the updated model

III. The final section of the user guide **(Chapters 6 and 7)** deals with how the adapted model can be used, and the limitations to its use

- **Chapter 6 discusses the kind of decision making** that the adapted model can support and illustrates this by providing sample outputs generated from the base model
- **Chapter 7 highlights the limitations of the model**

For definition of terms or concepts, refer to the Glossary and [Scaling Market Based Sanitation: Desk Review on Market-Based Rural Sanitation Development Programs]

3.0 OVERVIEW OF THE BASE MODEL

3.1 GEOGRAPHY SELECTED FOR THE BASE MODEL

To ensure that the base model was grounded in reality, and that no critical logical relationship was missed out in the process of abstraction, actual data from a sample geography was used to construct the base model. Using a real-world example also had the added benefit of allowing us to test the base model with experts who have experience of working in the sanitation sector in the sample geography.

To select an appropriate sample geography, we conducted desk research to identify interventions where demand activators had been recruited and were active, and where there was readily available data. Through this research, we were able to identify Bihar, India as the sample geography for the demand activation model.

In Bihar, Population Services International (PSI) through the Support Sustainable Sanitation Improvements (3SI)' program invested in developing a cadre of sales agents that were linked to sanitation entrepreneurs in order to increase toilet sales. Known as "toilet motivators," these sales agents were responsible for increasing awareness and activating demand through sales seminars and door-to-door visits. The 3SI program began in 2013, and since then it has engaged sales agents in one form or another. PSI played a direct role in recruiting, training, and incentivizing over 800 such sales agents, including paying them a commission on each toilet sale. Over the last five years, PSI has collected data on both the total sales by sanitation entrepreneurs and the percentage of these that were originated by sales agents. The data show that roughly 75% of all toilet sold by sanitation entrepreneurs were a result of demand activation by sales agents; though reliance on demand activators varies significantly from entrepreneur to entrepreneur (FSG research). The presence of the 3SI program, availability of detailed toilet sales data, and the availability of other essential information like coverage rates and population figures, is why Bihar was selected as the sample geography for the demand activation base model.

3.2 UNDERLYING LOGIC OF THE BASE MODEL

The intention of introducing a policy lever that supports demand activation is to increase sales; thereby increasing the viability of sanitation entrepreneurs. As seen in Figure 1, three main entrepreneur-level barriers prevent them from participating in sanitation markets:

- Low profitability and high opportunity cost in selling toilets, compared to alternatives
- Lack of affordable capital to invest in sanitation enterprise
- Limited availability of entrepreneurs in, especially in rural contexts

Among the many factors that can impact the viability of sanitation enterprises, low turnover and profitability—in margin or absolute terms—are often the major challenges that face rural sanitation enterprises. This also limits the availability of a sufficiently large pool of entrepreneurs as the low turnover/ profitability may dissuade potential entrepreneurs from entering the market, or lead to existing entrepreneurs exiting the market.

Interpersonal communications (IPC) in small group settings and/or one-to-one communication have been found to be relatively more effective for activating demand (Rios and Jenkins 2013) and increasing toilet sales. However, IPC activities are typically time-intensive, and as a result, in many cases enterprises do not actively market and sell their products; instead, they rely on inbound inquiries. To overcome enterprise reluctance to actively market, demand activator models in which independent agents generate

sales for sanitation enterprises, typically in exchange for a commission, have shown some promise (USAID, 2018).

The objective of demand activation is to convert interest in toilets to a decision to purchase. Demand activators should ideally possess persuasion skills, persistence, access to a community network or influence, and an ability to generate trust. While such demand activators may be motivated by monetary or non-monetary incentives, the demand activation model focuses on professional sales agents who are motivated by the opportunity to earn commissions as a primary or supplementary source of income.

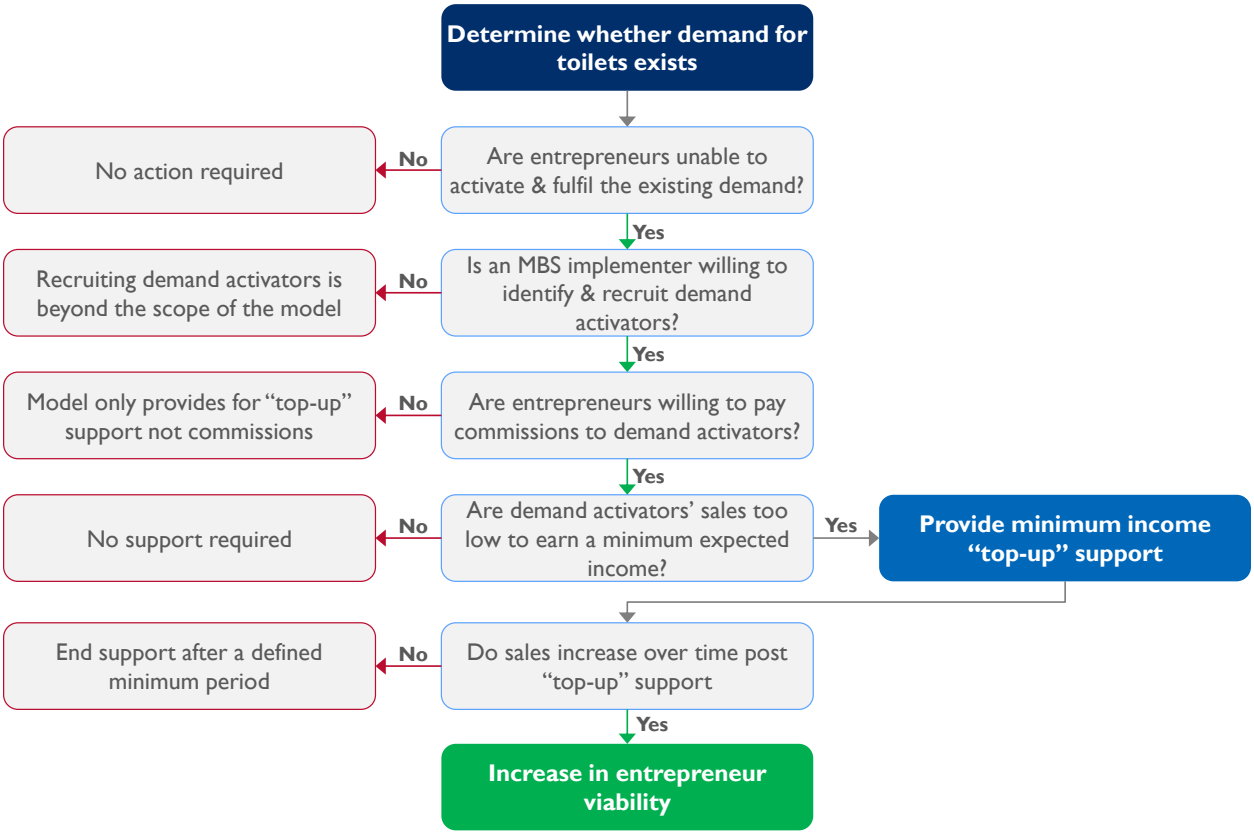
Identifying and recruiting individuals with the desired attributes, training these individuals, developing a commission system, and setting up a coordination mechanism requires significant investment in time and money. Further, once in place, the demand activators need time to build up their sales to a volume that provides a sufficient level of income through commissions. Entrepreneurs may not be willing or able to provide this investment, and therefore, setting up demand activation usually requires external support from MBS implementers. In some situations, implementers may even take over active management of agents, including paying commissions.

PSI provided this kind of support through the 3SI program. PSI managed DAs, helped organize village meetings, and paid agents' commissions. Using PSI's intervention as a reference, the base model attempts to estimate what the effect of such support could be on toilet sales in a given geography. However, the policy lever modeled limits the scope of support provided in comparison to what PSI provided to demand activators. The exact **policy lever modeled is a minimum income "top-up" guarantee provided by the government to demand activators** with the view of sustaining them until the volume of sales increases sufficiently. It is important to note that this support is only offered to agents already active in the market: **it is not intended to pay for new agent recruitment, training, or monitoring**.

Further, the monetary support provided is in the form of a "top-up" given to demand activators if they do not earn enough through sales commissions to meet a pre-defined minimum income level. This means that the entrepreneurs should be willing to pay for commissions on each toilet sold to a sales agent. **The government only steps in to provide the difference between what is earned through commissions and the minimum income threshold**; however, the government does not pay commissions on every toilet sold. The rationale behind the government not paying commissions is to start building in sustainability from the start; if the entrepreneurs are not willing to pay commissions, at all, the demand activation system would collapse once the government stops supporting it. Therefore, entrepreneurs need to pay commissions, and an MBS implementer may still be required to initiate and manage the demand activation process. However, the government shares the costs of embedding this mechanism in the hope of achieving sustainability and scale.

The logic on the basis of which the base model is built is depicted in Figure 3.

Figure 3: Underlying logic of the demand activation model



From the above figure we see that the starting question to be asked is whether demand exists in the selected geography. The focus of this model is on supply-side measures that can only succeed if a basic level of consumer demand exists for sanitation-related goods and services. CLTS is one intervention that seeks to elevate that demand, but it may exist for other reasons. Additionally, to justify the need for the demand activation market rule, it is necessary that any existing forms of demand activation be struggling. If demand activation is not a problem in the target market, then there is no need for introduction of a market rule. Additionally, the target market should have an organization to identify, recruit, and pay demand activators a commission per toilet sold. In the absence of any of these conditions, the policy lever will not work.

If demand activators have been recruited, the income "top-up" support can be introduced. Based on the minimum salary expectation of demand activators and the commission per toilet, the number of toilets that need to be sold to meet this minimum threshold can be determined. The monthly sales of demand activators would need to be tracked and verified (by entrepreneurs or MBS implementers), and in months the demand activators' sales do not equal the minimum threshold, the government provides the balance amount. This support continues till either the sales volume for commission income equal the minimum sales threshold, or till the duration of support ends. Note, the "top-up" support should not be indefinite as this may reduce the incentive of demand activators to sell toilets. The support period needs to be fixed and if sales do not increase by this time, the support should be withdrawn.

It should be noted, that the demand activation model stops at estimating the number of toilets sold by demand activators and the cost of supporting them. While literature and intervention research shows that this also has an impact on entrepreneur viability, the model does not actually estimate the increase in viability of a particular entrepreneur.

3.3 COMPONENTS OF THE BASE MODEL

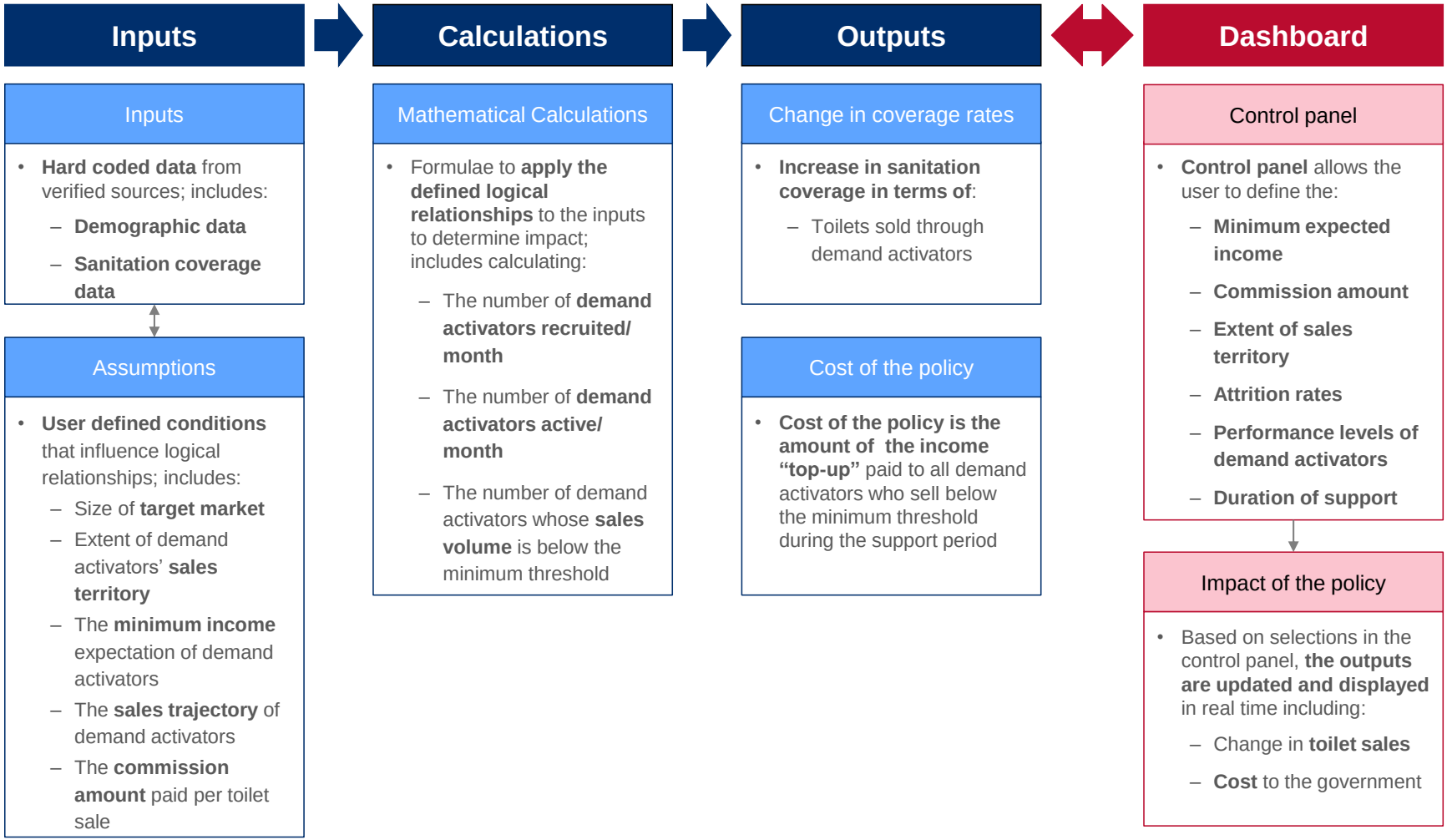
In order to convert this underlying logic into a model we would need the following components:

1. **Inputs** specific to the selected geography/ market such as data on population, sanitation coverage rates
2. **Assumptions** that set the overall boundaries within which the model would operate. As this model estimates the impact of **initiating** a demand activation model, by design, it cannot be based on existing data. Therefore, assumptions are required regarding key variables that have a direct bearing on the expected output:
    i. The total size of the market to be targeted (geographic extent and customer base)
    ii. The number of demand activators required; this is based on the number of geographical units (e.g., villages) or households that one demand activator can cover
    iii. The expected attrition rate of demand activators
    iv. The expected sales trajectory of demand activators
    v. The minimum income expectation of demand activators
    vi. The commission amount to be paid per toilet sold
3. **Mathematical calculations** that convert the inputs to outputs in line with the logical flow and assumptions defined above. This includes equations to calculate the number of demand activators recruited every month, the number who are active every month post attrition, and the number of demand activators whose monthly sales are below expected threshold
4. **Outputs** that arise from these inputs, assumptions, and calculations, viz., increase in the number of toilets sold and the associated costs

Figure 4 provides a visual representation of the components described above. As depicted, the inputs and assumptions are the base of the model, upon which formulae are applied to arrive at the outputs. In addition, a dashboard is overlaid on the model. This is an interactive sheet that allows the user to vary the values of the key variables, and see the impact on outputs in real-time.

These components are described in more detail in the following paragraphs. To help the reader keep track of the different components, the explanation provided for each component is preceded by a simplified version of the schematic seen in Figure 4 with only the component being discussed highlighted.

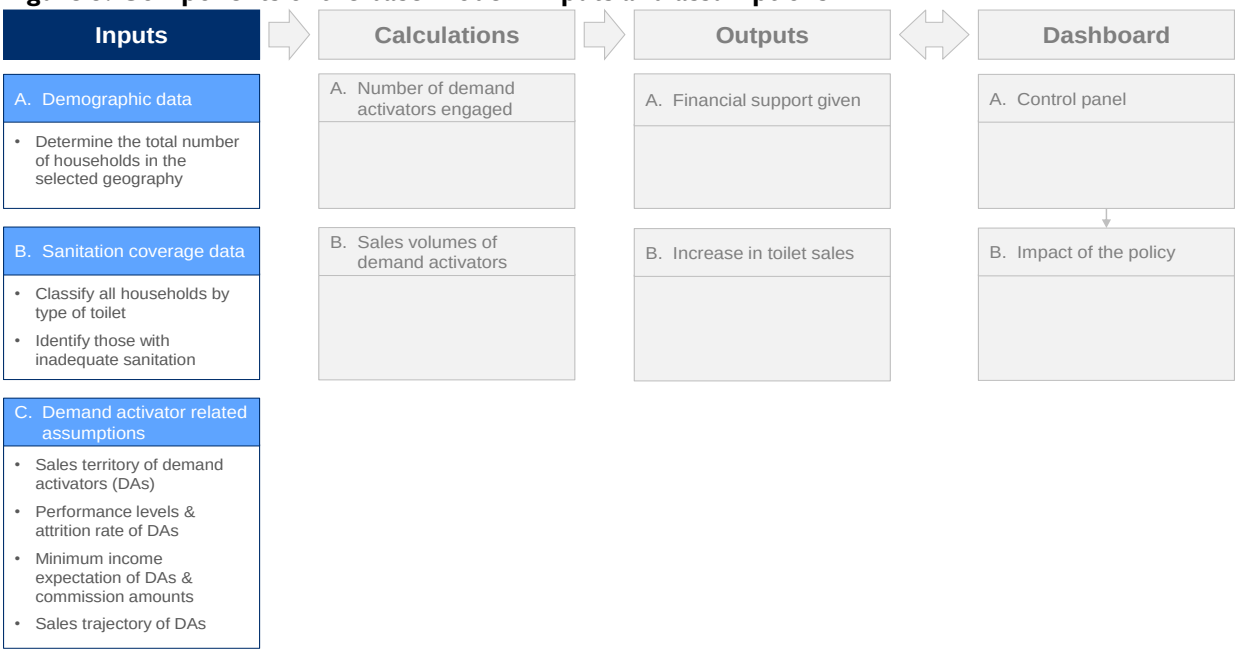
Figure 4: Schematic of the demand activation base model



3.3.1 Inputs and assumptions used in the base model

When building the base model, we started the inputs required to estimate the effect of the policy lever; Figure 5 highlights the specific component we refer to. From Figure 5, we can see that two types of inputs were required (in addition to the demand activator related assumption):

Figure 5: Components of the base model – inputs and assumptions



A. Demographic data: This included data such as the total number of households in the selected geography (disaggregated by urban and rural area) and the number of settlements in (e.g., village, town) in this geography. For the base model, we selected Bihar in India for research; further, within Bihar, we limited our research to the villages and towns in which PSI implemented the 3SI program. This was done so that we could cross-check the outputs of the model against actual sales figures achieved by the 3SI program. Data related to the 3SI program areas was gathered from program data shared by PSI, while the corresponding number of households and settlements in these areas was sourced from the Census of India, 2011. This data was captured in a dedicated input sheet; refer to "General inputs" in the accompanying base model, and used to define the size of the target market, and determine the sales territory of demand activators

B. Sanitation coverage data: In order to determine the actual size of the target market, we needed to identify the number of households without access to adequate sanitation facilities in the selected geography. In order to do this, we classified households in the selected geography by the various type of sanitation facilitates as defined by the WHO/ UNICEF Joint Monitoring Program (JMP); i.e., households that have access to at least basic sanitation (improved facilities), those that have limited access (improved facilities that are shared with one or more households), those with access to unimproved sanitation; and those defecating in the open (no access). Data on how many households in Bihar are present in each category was sourced from a Government of India dataset, viz., the National Family Health Survey (NFHS-4) 2015-2016. Of the households in these four categories, only those with at least basic access were considered to have adequate sanitation while the rest were consolidated into an unimproved (or inadequate) sanitation category. The households without adequate sanitation within the selected geography form the actual target market. This data was captured in the "General inputs" sheet

Figure 6 shows how the inputs were entered in the model.

Figure 6: Demographic and sanitation coverage data inputted in the base model

	A	B	C	D	E
2		Inputs	Data		
3	Demographic data		Total	Urban	Rural
4		Total Population	*28,920,888*	7,238,922	21,681,966
5		Mean Household Size	6.1	6.0	6.1
6		Number of Households	*4,760,908*	*1,206,487*	*3,554,421*
7		Number of HHs per town/ village		*11,042*	*581*
8		Number of towns/ villages		*109*	*6,118*
10	Sanitation coverage data	Sanitation coverage (%)	Total	Urban	Rural
11		At least basic	29.37%	54.90%	20.70%
12		Limited (shared)	8.38%	19.80%	4.50%
13		Unimproved	2.06%	3.40%	1.60%
14		Open defecation	60.20%	21.90%	73.20%
15		Sanitation coverage (# HHs)	Total	Urban	Rural
16		At least basic	*1,398,126*	*662,361*	*735,765*
17		Limited (shared)	*398,833*	*238,884*	*159,949*
18		Unimproved	*97,892*	*41,021*	*56,871*
19		Open defecation	*2,866,057*	*264,221*	*2,601,836*
20		Classifying HHs by level of service (#)	Total	Urban	Rural
21		Improved sanitation	*1,398,126*	*662,361*	*735,765*
22		Unimproved sanitation (including open defecation)	*3,362,782*	*544,126*	*2,818,656*

Sheet name as per attached demand activation base model: "General inputs"

C. **Demand activator-related assumptions:** As the model attempts to estimate the change in toilet sales that could arise if demand activators were supported, it implies that a demand activation mechanism does not presently exist. Therefore, no actual data on number of demand activators was used; instead, assumptions were used to arrive at the number. While data was available on the number of demand activators PSI engaged in Bihar, this was used to validate if our assumptions were realistic and not directly entered into the model. In order to estimate increase in toilet sales, and the cost of supporting demand activators, the following data is required:

a. **The actual size of the target market** refers to the number of households who are targeted in the policy. The inputs captured defined the number of settlements in the selected geography. We used assumptions for the percentage of settlements in urban and rural areas in which the government would introduce the policy. For example, in the PSI area there were a total of 6,118 villages and 109 towns. We assumed that the policy would be implemented in 50% of all villages and 10% of all towns (see the yellow box in Figure 7); i.e., in ~3,059 villages and ~11 towns

b. **The number of demand activators required** is defined based on assumptions of how many settlements/ households a demand activator can cover. In the 3SI program, one demand activator covers ~12 villages, which translates into ~6,972 households (according to the Census of India – 2011, on average there are 581 households per village in PSI areas). Using the same ratio of ~6,972 villages, we determined that one demand activator could cover less than half a town, as the average number of households in towns in PSI's areas is ~11,042 (see the green box in Figure 7). Once we calculated the number of villages and towns one demand activator could cover (the sales territory), we divided the actual number of settlements in which the policy is implemented by these numbers to arrive at the figure of 272 sales agents required in the first year (255 in rural areas, and 17 in urban areas); see the purple box in Figure 7. The model covers a period of three years, and it is assumed that the number of sales agents in a settlement will increase year on year as more sales agents are attracted to the market due to the government's support. Therefore, while the number of settlements targeted does not increase in the three years, the number of demand activators increases every year

Figure 7: Number of demand activators required

	A	B	C	D	E
24	Demand activator data	Number of demand activators required			
25			Year 1	Year 2	Year 3
26		Number of villages covered by 1 Demand Activator	*12*	*9*	*6*
27		Number of towns covered by 1 Demand Activator	*0.6*	*0.5*	*0.3*
28		Percentage of villages targeted	50%	50%	50%
29		Percentage of towns targeted	10%	10%	10%
30		Number of Rural Demand Activators required	*255*	*340*	*510*
31		Number of Urban Demand Activators required	*17*	*24*	*34*
32		Total number of Demand Activators required	***272***	***364***	***544***

Sheet name as per attached demand activation base model: "General inputs"

c. **The minimum income** from all income-generating activities that a potential demand activator expects to earn. For the base model, we did this based on the salary of full-time sales agents that PSI engaged at the start of the program. While PSI later moved to a model in which sales agents sold toilets only part-time, the total salary expected was

based on the earlier figure of USD 230 a month. Further, it was assumed that the part-time sales agents would spend ~30% of their time selling toilets, and hence, the minimum expected income from toilet sales is USD 69. The user can change these figures in the "Dashboard" sheet if required (see the green box in Figure 8)

d. **The commission paid per toilet sold** refers to the amount per toilet that the entrepreneur pays demand activators for their services. For the base model, we used the commission amount that the 3SI program uses. Under the 3SI program, the commission amount is contingent on the number of toilets sold; between 0-4 toilets a month, sales agents get USD 1.50 per toilet; between 5-9 toilets a month, sales agents get USD 1.80 per toilet; and for sale of 10 or more toilets a month, sales agents get USD 2.30 per toilet (see the purple box in Figure 8). The reason for having commission slabs is to incentivize sales agents to try and sell greater number of toilets. The user can update the commission slabs by setting the minimum value for each slab as seen in the yellow box in Figure 8

Figure 8: Minimum income assumptions

	A	B	C	D	E
54		**Remuneration of demand activators**			
55			**Year 1**	**Year 2**	**Year 3**
56		Expected income/ month from all income generating activities (USD)	230	230	230
57		Average % of time dedicated to toilet sales	30%	30%	30%
58		Minimum expected income (USD)	*69*	*69*	*69*
59		Commission/ toilet for Slab DAs whose monthly sales fall in 1 (USD)	1.50	1.50	1.50
60		Commission/ toilet for DAs whose monthly sales fall in Slab 2 (USD)	1.80	1.80	1.80
61		Commission/ toilet for DAs whose monthly sales fall in Slab 3 (USD)	2.30	2.30	2.30
62		Commission/ toilet for DAs whose monthly sales exceed the minimum threshold (USD)	2.30	2.30	2.30
63		**Commission slabs**			
64		**Slab**	**Minimum number of toilets sold in a slab**		
65			**Year 1**	**Year 2**	**Year 3**
66		Slab 1	-	-	-
67		Slab 2	5	5	5
68		Slab 3	10	10	10
69		Sales threshold (# of toilets/ month)	*30*	*30*	*30*

Sheet name as per attached demand activation base model: "General inputs"

e. **The minimum sales threshold** was defined as the number of toilets per month at which the income from sales commissions wholly equal the minimum income expected from selling toilets (USD 69). This was calculated by dividing the minimum income expected (USD 69) by the commission pad at the highest sales slab (USD 2.30). Therefore, for the base model the minimum threshold set was 30 toilets. The user can change these figures in the "Dashboard" sheet if required (see the yellow box in Figure 8)

f. **The performance level of demand activators** refers to the percentage of sales agents that are expected to achieve strong vs. poor sales. Based on a historical analysis of PSI's data, we realized that demand activators could be categorized into three categories:

   i. Demand activators with stable sales – these demand activators see increasing sales month-on-month until the number of toilets sold in a month plateaus at a

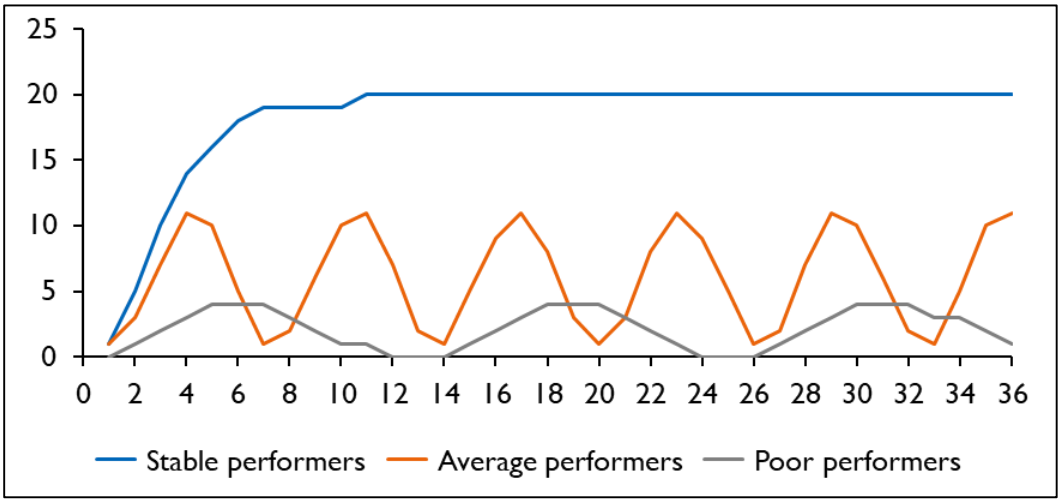
level that is above the minimum sales threshold needed to earn the minimum expected income

ii. Demand activators with average sales – these demand activators see rising month-on-month sales initially, and then have fluctuating sales within a range that is lower than the minimum sales threshold required to earn the minimum expected income

iii. Demand activators with poor sales – these demand activators are never consistently engaged in selling toilets and ultimately act as passive and opportunistic players who sell toilets whenever people approach them or demand is high (e.g., post-harvest)

The first category tends to be the smallest percentage of the total sales agents, with the majority being concentrated in the middle and bottom categories. In the base model, the user can determine the percentage of sales agents that are expected to fall into each of these categories (see the green box in Figure 9)

The chart below shows sample sales trajectories for the three categories of demand activators. This chart has been produced using data from the 'DA recruitment and sales inputs' sheet.



g. **The attrition rate** of demand activators refers percentage of recruited sales agents who do not continue selling toilets. It is assumed that all demand activators recruited would stay engaged for at least two months, but from the third month onwards a certain percentage of the demand activators recruited will drop out. Further, it is assumed that more demand activators with poor sales will drop out than those with average sales or stable sales (see the yellow box in Figure 9). The user can update the value of demand activators expected to drop out in the user dashboard

Figure 9: Assumptions regarding performance levels of demand activators

	A	B	C	D	E
24	Demand activator data	Number of demand activators required			
25			Year 1	Year 2	Year 3
33		% of DAs with stable sales	20.00%		
34		% of DAs with average sales	50.00%		
35		% of DAs with poor sales	30.00%		
36		# of required DAs with stable sales	*54*	*73*	*109*
37		# of required DAs with average sales	*136*	*182*	*272*
38		# of required DAs with poor sales	*82*	*109*	*163*
39		Attrition rate of DAs with stable sales (every three months)	*5%*		
40		Attrition rate of DAs with average sales (every three months)	*20%*		
41		Attrition rate of DAs with poor sales (every three months)	*50%*		
42		**# of DAs recruited**	***391.00***	***523.00***	***781.00***
43		# of recruited DAs with stable sales	*57.00*	*77.00*	*115.00*
44		# of recruited DAs with average sales	*170.00*	*228.00*	*340.00*
45		# of recruited DAs with poor sales	*164.00*	*218.00*	*326.00*

Sheet name as per attached demand activation base model: "General inputs"

h. **The number of demand activators recruited** is the actual number of sales agents that would need to be engaged every month to ensure that the required number of demand activators are available after taking into account the expected attrition rate. This is calculated by dividing the number of demand activators needed by one minus the attrition rate (see the purple box in Figure 9). It is assumed that the demand activators will be recruited in a way that the total number to be recruited in a year is achieved by the last month of that year; further we assume that there will be a higher level of recruitment in the first three months as the intervention ramps up. The way in which the number of demand activators recruited is spread month-wise over three years can be seen from the green box in Figure 11. As seen in this figure, the recruitment is broken up by the expected performance level. It should be noted that it is not that the sales agents are recruited separately in these categories; but that it is estimated split of all sales agents recruited by performance level

i. **The number of active demand activators** in any month is the difference between the number recruited in a month and the number of sales agents who drop off each month. This is the cumulative number of DAs recruited till that month (green box in Figure 11) less the cumulative number who have dropped out till that month (yellow box in Figure 11). Note that the attrition starts only from the third month in line with our assumption that all demand activators recruited will be active for at least two months. The number of demand activators dropping out in month three, is a percentage of the demand activators recruited in month 1 and this is repeated in subsequent months. The actual number active is shown in the purple box in Figure 11

j. **The sales trajectory of demand activators** is assumed to be different depending on the different performance levels of the sales agents. As mentioned above, demand activators with stable sales see increasing month-on-month sales until it plateaus at a point higher than the minimum sales threshold; those with average sales see slowly rising sales that stay below the minimum threshold and with variation month-on-month; and those with poor sales see very low sales volumes and sell only sporadically. To model these trajectories, we have used different line formulae (see Figure 11).

For those with stable sales, an exponential curve that plateaus at a particular point was used. To calculate the trajectory, the user needs to enter the highest volume (C47 in Figure 10) that is expected (at which point sales will plateau), the number of months it will take to achieve half the highest volume of sales (C48 in Figure 10); and the expected slope of the line (C49 in Figure 10). For those with average sales, a sine curve formula is used, wherein the user needs to enter the average monthly sales expected (C52 in Figure 10) and the expected variance from this average (C53 in Figure 10). For those with poor sales, the sine curve formula is again used, but with a lower average sales figure (D52 in Figure 10) and a higher variance (D53 in Figure 10)

Figure 10: Assumptions regarding sales trajectory of demand activators

	A	B	C	D	E
46	Demand activator data	**Projected sales of demand activators with stable sales**			
47		Highest toilet sales/ month over intervention lifetime	40	16	4
48		# months taken to achieve half of the highest sales	3.5		
49		Slope of sales trajectory	2.5		
50		**Projected sales of demand activators with average and poor sales**			
51			**DAs with average sales**	**DAs with poor sales**	
52		Mean toilet sales/ month over intervention lifetime	9	2	
53		Variance from mean toilet sales/ month	7	2	

Sheet name as per attached demand activation base model: "General inputs"

These assumptions taken together will inform how many demand activators are actively selling toilets every month, and the number of toilets they sell. From the blue box in Figure 11 we can see how the line equations inputted in Figure 10 lead to a month-wise sales figure. For example, in "Row 19" the maximum value set of 40 (cell C47 in Figure 10), and in "Row 20" the average is 9 toiles sold per month over the 3 years, with the maximum being 16 toilets, and the minimum being 2 toilets due to the variance of 7 set in C53 in Figure 10.

Figure 11: Active demand activators and their monthly sales

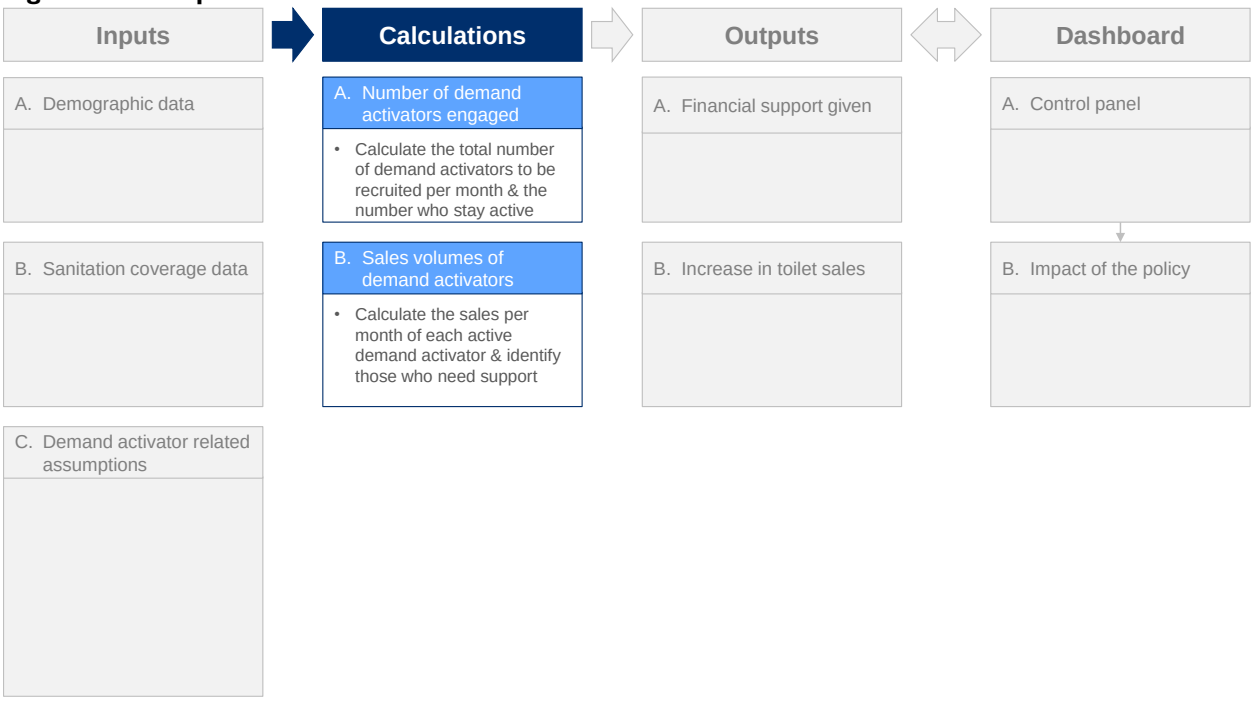
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK
2	Number of Demand Activators recruited/ calendar month																																				
3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
4	*Stable performers*	*10*	*10*	*10*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*2*	*1*	*2*	*2*	*1*	*2*	*2*	*1*	*2*	*2*	*1*	*2*	*3*	*4*	*3*	*3*	*3*	*3*	*4*	*3*	*3*	*3*	*3*	*3*
5	*Average performers*	*28*	*28*	*28*	*10*	*10*	*9*	*10*	*9*	*10*	*9*	*10*	*9*	*5*	*4*	*5*	*5*	*5*	*5*	*5*	*4*	*5*	*5*	*5*	*5*	*9*	*10*	*9*	*10*	*9*	*9*	*10*	*9*	*9*	*10*	*9*	*9*
6	*Poor performers*	*27*	*27*	*27*	*9*	*9*	*9*	*9*	*9*	*10*	*9*	*10*	*9*	*5*	*4*	*5*	*4*	*5*	*4*	*5*	*4*	*5*	*4*	*5*	*4*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*
7	Number of drop outs/ calendar month																																				
8		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
9	Stable performers			*1*	*1*	*1*	*1*	*1*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
10	Average performers			*6*	*6*	*6*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
11	Poor performers			*14*	*14*	*14*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*3*	*2*	*3*	*2*	*3*	*2*	*3*	*2*	*3*	*2*	*3*	*2*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*1*
12	Number of active DAs/ calendar month																																				
13		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
14	Stable performers	*10*	*20*	*29*	*31*	*33*	*35*	*37*	*39*	*42*	*45*	*48*	*51*	*53*	*54*	*56*	*58*	*59*	*61*	*63*	*64*	*66*	*68*	*69*	*71*	*74*	*78*	*81*	*84*	*87*	*90*	*94*	*97*	*100*	*103*	*106*	*109*
15	Average performers	*28*	*56*	*78*	*82*	*86*	*93*	*101*	*108*	*116*	*123*	*131*	*138*	*141*	*143*	*147*	*151*	*155*	*159*	*163*	*166*	*170*	*174*	*178*	*182*	*190*	*199*	*206*	*214*	*221*	*228*	*236*	*243*	*250*	*258*	*265*	*272*
16	Poor performers	*27*	*54*	*67*	*62*	*57*	*61*	*65*	*69*	*74*	*78*	*83*	*87*	*87*	*86*	*88*	*90*	*92*	*94*	*96*	*98*	*100*	*102*	*104*	*106*	*112*	*119*	*123*	*127*	*131*	*135*	*139*	*143*	*147*	*151*	*155*	*163*
17	Sales trajectory																																				
18		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
19	Stable performers	2	8	16	23	28	32	34	36	37	37	38	38	39	39	39	39	39	39	39	39	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
20	Average performers	2	4	11	16	14	8	3	3	9	15	15	10	4	2	7	14	16	12	5	2	5	12	16	14	7	2	4	10	15	15	9	3	3	8	14	16
21	Poor performers	-	1	2	3	4	4	4	3	2	1	1	-	-	-	1	2	3	4	4	4	3	2	1	-	-	-	1	2	3	4	4	4	3	3	2	1

Sheet name as per attached demand activation base model: "DA recruitment and sales inputs"

3.3.2 Mathematical calculations developed for the base model

Once the inputs and assumptions were defined, mathematical calculations were developed to calculate the aggregate number of sales agents engaged and the volume of sales that fall within each commission band (see Figure 12).

Figure 12: Components of the base model – mathematical calculations



There are a total of seven calculation sheets in the base model. The sales trajectory shown in the blue box in Figure 11 represents the number of toilets sold by a demand activator in each month. However, the figure of 2 toilets in month 1 seen in cell "B19" of Figure 11 is not the number of toilets sold by a stable sales agent in the first calendar month, but the number sold in the first month a sales agent is active. Therefore every sales agent recruited (who is a stable performer) would sell 2 toilets in the first month he/ she is active. Therefore, the 10 sales agents recruited in calendar month 1 (cell "B4" in the green box in Figure 11) will sell 2 toilets in their first month, and the 3 sales agents recruited in month 12 (cell "M4" in the green box in Figure 11) will also sell 2 toilets in their first month.

Therefore, in order to determine the total number of sales agents selling a particular number of toilets in a calendar month, four calculation sheets were prepared. Three of these four sheets – "Poor performing DAs," "Average performing DAs," and "Stable performing DAs" – aggregate the number of sales agents at each performance level who are active each month at each level of sales; i.e., the number of demand activators active and selling 2 toilets in a calendar month versus the number that sell 32 toilets in that month. The fourth sheet – "Total active DAs" – aggregates the total number of demand activators across all performance levels in one sheet who are active at each level of sales. The three sheets for each category of sales agents all have identical structures, and hence we explain the working of the sheets using one of these sheets; viz., the "Stable performing DAs" sheet (see Figure 13 and Figure 14).

Each of these sheets has two tables, one (Figure 13) counts all the active demand activators at each level of sales over the entire three year model period (only two years shown in the figure), while the other (Figure 14) does the same, but only for the duration for which the government provides support (policy period).

Figure 13: Number of active demand activators at each level of sale (model period)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
42			Total Number of Demand Activators per calendar month																							
43	Average monthly toilets sales/ DA		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
44	Sales by DAs in their 1st month	2	10	10	10	3	3	3	3	3	3	3	3	3	2	1	2	2	1	2	2	1	2	2	1	2
45	Sales by DAs in their 2nd month	8		10	10	10	3	3	3	3	3	3	3	3	3	2	1	2	2	1	2	2	1	2	2	1
46	Sales by DAs in their 3rd month	16			9	9	9	2	2	2	3	3	3	3	3	3	2	1	2	2	1	2	2	1	2	2
47	Sales by DAs in their 4th month	23				9	9	9	2	2	2	3	3	3	3	3	3	2	1	2	2	1	2	2	1	2
48	Sales by DAs in their 5th month	28					9	9	9	2	2	2	3	3	3	3	3	3	2	1	2	2	1	2	2	1
49	Sales by DAs in their 6th month	32						9	9	9	2	2	2	3	3	3	3	3	3	2	1	2	2	1	2	2
50	Sales by DAs in their 7th month	34							9	9	9	2	2	2	3	3	3	3	3	3	2	1	2	2	1	2
51	Sales by DAs in their 8th month	36								9	9	9	2	2	2	3	3	3	3	3	3	2	1	2	2	1
52	Sales by DAs in their 9th month	37									9	9	9	2	2	2	3	3	3	3	3	3	2	1	2	2
53	Sales by DAs in their 10th month	37										9	9	9	2	2	2	3	3	3	3	3	3	2	1	2
54	Sales by DAs in their 11th month	38											9	9	9	2	2	2	3	3	3	3	3	3	2	1
55	Sales by DAs in their 12th month	38												9	9	9	2	2	2	3	3	3	3	3	3	2
56	Sales by DAs in their 13th month	39													9	9	9	2	2	2	3	3	3	3	3	3
57	Sales by DAs in their 14th month	39														9	9	9	2	2	2	3	3	3	3	3
58	Sales by DAs in their 15th month	39															9	9	9	2	2	2	3	3	3	3
59	Sales by DAs in their 16th month	39																9	9	9	2	2	2	3	3	3
60	Sales by DAs in their 17th month	39																	9	9	9	2	2	2	3	3
61	Sales by DAs in their 18th month	39																		9	9	9	2	2	2	3
62	Sales by DAs in their 19th month	39																			9	9	9	2	2	2
63	Sales by DAs in their 20th month	39																				9	9	9	2	2
64	Sales by DAs in their 21st month	40																					9	9	9	2
65	Sales by DAs in their 22nd month	40																						9	9	9
66	Sales by DAs in their 23rd month	40																							9	9
67	Sales by DAs in their 24th month	40																								9
68	Sales by DAs in their 25th month	40																								
69	Sales by DAs in their 26th month	40																								
70	Sales by DAs in their 27th month	40																								
71	Sales by DAs in their 28th month	40																								
72	Sales by DAs in their 29th month	40																								
73	Sales by DAs in their 30th month	40																								
74	Sales by DAs in their 31st month	40																								
75	Sales by DAs in their 32nd month	40																								
76	Sales by DAs in their 33rd month	40																								
77	Sales by DAs in their 34th month	40																								
78	Sales by DAs in their 35th month	40																								
79	Sales by DAs in their 36th month	40																								
80	Total		10	20	29	31	33	35	37	39	42	45	48	51	53	54	56	58	59	61	63	64	66	68	69	71

Figure 14: Number of active demand activators at each level of sales (policy period)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
2			Number of Demand Activators Supported per calendar month																							
3	Average monthly toilets sales/ DA		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
4	Sales by DAs in their 1st month	2	10	10	10	3	3	3	3	3	3	3	3	3												
5	Sales by DAs in their 2nd month	8	-	10	10	10	3	3	3	3	3	3	3	3												
6	Sales by DAs in their 3rd month	16	-	-	9	9	9	2	2	2	3	3	3	3												
7	Sales by DAs in their 4th month	23	-	-	-	9	9	9	2	2	2	3	3	3												
8	Sales by DAs in their 5th month	28	-	-	-	-	9	9	9	2	2	2	3	3												
9	Sales by DAs in their 6th month	32	-	-	-	-	-	9	9	9	2	2	2	3												
10	Sales by DAs in their 7th month	34	-	-	-	-	-	-	9	9	9	2	2	2												
11	Sales by DAs in their 8th month	36	-	-	-	-	-	-	-	9	9	9	2	2												
12	Sales by DAs in their 9th month	37	-	-	-	-	-	-	-	-	9	9	9	2												
13	Sales by DAs in their 10th month	37	-	-	-	-	-	-	-	-	-	9	9	9												
14	Sales by DAs in their 11th month	38	-	-	-	-	-	-	-	-	-	-	9	9												
15	Sales by DAs in their 12th month	38	-	-	-	-	-	-	-	-	-	-	-	9												
16	Sales by DAs in their 13th month	39	-	-	-	-	-	-	-	-	-	-	-	-												
17	Sales by DAs in their 14th month	39	-	-	-	-	-	-	-	-	-	-	-	-												
18	Sales by DAs in their 15th month	39	-	-	-	-	-	-	-	-	-	-	-	-												
19	Sales by DAs in their 16th month	39	-	-	-	-	-	-	-	-	-	-	-	-												
20	Sales by DAs in their 17th month	39	-	-	-	-	-	-	-	-	-	-	-	-												
21	Sales by DAs in their 18th month	39	-	-	-	-	-	-	-	-	-	-	-	-												
22	Sales by DAs in their 19th month	39	-	-	-	-	-	-	-	-	-	-	-	-												
23	Sales by DAs in their 20th month	39	-	-	-	-	-	-	-	-	-	-	-	-												
24	Sales by DAs in their 21st month	40	-	-	-	-	-	-	-	-	-	-	-	-												
25	Sales by DAs in their 22nd month	40	-	-	-	-	-	-	-	-	-	-	-	-												
26	Sales by DAs in their 23rd month	40	-	-	-	-	-	-	-	-	-	-	-	-												
27	Sales by DAs in their 24th month	40	-	-	-	-	-	-	-	-	-	-	-	-												
28	Sales by DAs in their 25th month	40	-	-	-	-	-	-	-	-	-	-	-	-												
29	Sales by DAs in their 26th month	40	-	-	-	-	-	-	-	-	-	-	-	-												
30	Sales by DAs in their 27th month	40	-	-	-	-	-	-	-	-	-	-	-	-												
31	Sales by DAs in their 28th month	40	-	-	-	-	-	-	-	-	-	-	-	-												
32	Sales by DAs in their 29th month	40	-	-	-	-	-	-	-	-	-	-	-	-												
33	Sales by DAs in their 30th month	40	-	-	-	-	-	-	-	-	-	-	-	-												
34	Sales by DAs in their 31st month	40	-	-	-	-	-	-	-	-	-	-	-	-												
35	Sales by DAs in their 32nd month	40	-	-	-	-	-	-	-	-	-	-	-	-												
36	Sales by DAs in their 33rd month	40	-	-	-	-	-	-	-	-	-	-	-	-												
37	Sales by DAs in their 34th month	40	-	-	-	-	-	-	-	-	-	-	-	-												
38	Sales by DAs in their 35th month	40	-	-	-	-	-	-	-	-	-	-	-	-												
39	Sales by DAs in their 36th month	40	-	-	-	-	-	-	-	-	-	-	-	-												
40	Total		10	20	29	31	33	35	37	39	42	45	48	51	-	-	-	-	-	-	-	-	-	-	-	-

"Column B," in Figure 13 shows the sales trajectory of stable performing sales agents as defined in the "DA recruitment and sales input" sheet; while "Row 3" depicts each calendar month. The sales trajectory automatically updates to reflect the options set in the "DA recruitment and sales input" sheets. The cells in the table display how many sales agents were active in a particular calendar month selling the number of toilets defined by the sales trajectory. For example, 3 active sales agents sold 2 toilets each in month 6 (cell "H44"); 2 active sales agents sold 16 toilets each in the same month (cell "H46"); and 9 active sales agents sold 32 toilets in that month ("Cell H49"). This is done for the whole three years that the model is constructed for.

The table in Figure 14 is a duplicate of that shown in Figure 13. The difference is that only the number of sales agents active in the first 12 months is shown in Figure 14, while the rest are blanked out. This is because when the screenshot was taken, the duration of support for sales agents with stable sales was set at 12 months. If the user changes the number of months for which support is provided (this can be done in the dashboard), the table in Figure 14 will automatically hide, or reveal more rows in accordance with the setting. The reason for doing this is so that we can determine the number of sales agents who need to be paid the "top-up" support and the number of toilets sold that can be directly attributed to the support provided. The table on Figure 13 on the other hand is needed to see the total sales achieved due to sales agents being engaged by the policy lever, even after support is withdrawn. This allows us to assess the indirect effect of the policy.

The number of demand activators at each level of sale across all three performance levels is aggregated in the "Total active DAs" sheet (Figure 15). "Column A" in Figure 15 provides a count of possible toilet sales per month from 1 to 50, while "Row 3" depicts each calendar month. Each monthly column in this table contains a formula that matches the sales trajectories in the individual sales agents sheet (e.g., "Column B" in Figure 13) with the possible sales in each month ("Column A" in Figure 15). If the values in these columns match, the formula adds all the active sales agents in that month (from all three individual sales agent sheets) and displays it against the corresponding level of toilet sales.

For example, in Figure 15, we can see that 9 active DAs sold zero toilets in month 6 (cell "G4"), while 16 active DAs sold 2 toilets in month 6 (cell "G6"), and 9 active sales agents sold 32 toilets each in month 6 (cell "G36"). We see that in month 6 there are again 9 active sales agents who sold 32 toilets each; this is the same as was seen in the previous example of stable demand activators in Figure 13 and Figure 14. This is because only the stable demand activators manage to sell more than 30 toilets a month as per our assumed sales trajectories.

To determine the actual number of toilets sold every month by all active sales agents in that month, for each column in Figure 15, we multiply the number of active sales agents in that month with the corresponding level of toilet sales in "Column A." For example, to know the total number of toilets sold in month 6, we would multiply, "G4" with "A4," "G5" by "A5," "G6" by "A6" and so on for the whole month. We then add all the numbers up to arrive at the total toilets sold in that month. To display this, a "Total sales" sheet was created (see Figure 16). If you see "Column G" in Figure 16, we can see that 1,961 toilets were sold in that month (cell "G55"). Further, we can see that of these 1,961 toilets, 32 toilets were sold by sales agents who sold 2 toilets each in that month (cell "G6"), 200 were sold by sales agents who sold 8 toilets each that month (cell "G12"), and 288 toilets were sold by sales agents who sold 32 toilets a month each (cell "G36"). This is important to know as commissions are paid out by the level of sale; therefore, the 32 toilets in "G6" would earn their sales agents USD 1.50 each (as the lowest commission slab is 0-4 toilets); the 200 toilets in "G12" would earn the sales agents USD 1.80 each (as the middle slab is 5-9 toilets); and the 288 toilets in "G36" would earn the sales agents USD 2.30 each (as the top most slab is 10 toilets and above).

Figure 15: Total active demand activators (model period)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
2	Average monthly	# of Demand Activators per calendar month																							
3	toilets sales/ DA	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
4	0	27	27	27	9	9	9	9	9	10	9	10	22	31	43	35	25	17	16	17	17	18	18	18	28
5	1		27	27	27	9	9	9	9	9	23	35	36	26	13	25	26	25	18	17	18	17	15	26	26
6	2	38	38	51	26	26	16	17	16	30	29	31	20	16	35	35	48	34	34	25	45	44	58	42	45
7	3				13	13	13	26	61	61	47	24	24	23	24	23	22	34	35	30	15	28	29	29	20
8	4		28	28	28	23	36	48	40	30	22	21	22	44	40	40	26	24	33	45	57	48	39	31	30
9	5																			22	22	44	30	30	15
10	6																								
11	7															22	22	22	8	8	7	8	7	8	7
12	8		10	10	10	3	25	25	25	11	11	10	11	10	10	8	10	9	5	5	6	5	6	6	5
13	9									22	22	22	8	8	7	8	7	8	7	8	7	4	3	4	4
14	10												22	22	22	8	8	7	8	7	8	7	8	7	4
15	11			22	22	22	8	8	7	8	7	8	7	8	7	4	3	4	4	4	4	4	3	4	4
16	12																		22	22	22	8	30	29	30
17	13																								
18	14					22	22	22	8	8	7	8	7	8	7	8	29	26	25	12	12	11	12	11	33
19	15										22	44	44	30	16	15	15	15	15	15	15	15	11	7	7
20	16			9	31	31	24	10	10	10	11	10	11	10	11	9	5	27	28	27	14	14	12	35	35
21	17																								
22	18																								
23	19																								
24	20																								
25	21																								
26	22																								
27	23				9	9	9	2	2	2	3	3	3	3	3	3	2	1	2	2	1	2	2	1	2
28	24																								
29	25																								
30	26																								
31	27																								
32	28					9	9	9	2	2	2	3	3	3	3	3	3	2	1	2	2	1	2	2	1
33	29																								
34	30																								
35	31																								
36	32						9	9	9	2	2	2	3	3	3	3	3	3	2	1	2	2	1	2	2
37	33																								
38	34							9	9	9	2	2	2	3	3	3	3	3	3	2	1	2	2	1	2
39	35																								
40	36								9	9	9	2	2	2	3	3	3	3	3	3	2	1	2	2	1
41	37									9	18	18	11	4	4	5	6	6	6	6	6	5	3	3	4
42	38											9	18	18	11	4	4	5	6	6	6	6	6	5	3
43	39													9	18	27	29	31	33	36	39	33	27	21	22
44	40																					9	18	27	29
45	41																								
46	42																								
47	43																								
48	44																								
49	45																								
50	46																								
51	47																								
52	48																								
53	49																								
54	50																								
55	# DAs to be supported	65	130	174	175	176	189	203	216	232	246	262	276	281	283	291	299	306	314	322	328	336	344	351	359

Sheet name as per attached demand activation base model: "Total active DAs"

Figure 16: Total sales by all active demand activators (model period)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
2	Average monthly	# of toilets sold per calendar month																							
3	toilets sales/ DA	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
4	0																								
5	1		27	27	27	9	9	9	9	9	23	35	36	26	13	25	26	25	18	17	18	17	15	26	26
6	2	76	76	102	52	52	32	34	32	60	58	62	40	32	70	70	96	68	68	50	90	88	116	84	90
7	3				39	39	39	78	183	183	141	72	72	69	72	69	66	102	105	90	45	84	87	87	60
8	4		112	112	112	92	144	192	160	120	88	84	88	176	160	160	104	96	132	180	228	192	156	124	120
9	5																			110	110	220	150	150	75
10	6																								
11	7															154	154	154	56	56	49	56	49	56	49
12	8		80	80	80	24	200	200	200	88	88	80	88	80	80	64	80	72	40	40	48	40	48	48	40
13	9									198	198	198	72	72	63	72	63	72	63	72	63	36	27	36	36
14	10												220	220	220	80	80	70	80	70	80	70	80	70	40
15	11			242	242	242	88	88	77	88	77	88	77	88	77	44	33	44	44	44	44	44	33	44	44
16	12																		264	264	264	96	360	348	360
17	13																								
18	14					308	308	308	112	112	98	112	98	112	98	112	406	364	350	168	168	154	168	154	462
19	15										330	660	660	450	240	225	225	225	225	225	225	225	165	105	105
20	16			144	496	496	384	160	160	160	176	160	176	160	176	144	80	432	448	432	224	224	192	560	560
21	17																								
22	18																								
23	19																								
24	20																								
25	21																								
26	22																								
27	23				207	207	207	46	46	46	69	69	69	69	69	69	46	23	46	46	23	46	46	23	46
28	24																								
29	25																								
30	26																								
31	27																								
32	28					252	252	252	56	56	56	84	84	84	84	84	84	56	28	56	56	28	56	56	28
33	29																								
34	30																								
35	31																								
36	32						288	288	288	64	64	64	96	96	96	96	96	96	64	32	64	64	32	64	64
37	33																								
38	34							306	306	306	68	68	68	102	102	102	102	102	102	68	34	68	68	34	68
39	35																								
40	36								324	324	324	72	72	72	108	108	108	108	108	108	72	36	72	72	36
41	37									333	666	666	407	148	148	185	222	222	222	222	222	185	111	111	148
42	38											342	684	684	418	152	152	190	228	228	228	228	228	190	114
43	39													351	702	1053	1131	1209	1287	1404	1521	1287	1053	819	858
44	40																					360	720	1080	1160
45	41																								
46	42																								
47	43																								
48	44																								
49	45																								
50	46																								
51	47																								
52	48																								
53	49																								
54	50																								
55	Total monthly sales	76	295	707	1,255	1,721	1,951	1,961	1,953	2,147	2,524	2,916	3,107	3,091	2,996	3,068	3,354	3,730	3,978	3,982	3,876	3,848	4,032	4,341	4,589

Sheet name as per attached demand activation base model: "Total sales"

The number of sales agents and total sales described in Figure 15 and Figure 16 refer to the total number of sales agents and sales over the entire model period. This is because the figures have been taken from the tables shown in Figure 13 which count demand activator by sales level over the entire model period. However, in order to know how many sales agents are to be provided "top-up" support during the policy period, the same process needs to be repeated with the table shown in Figure 14 which is the count of sales agent at each level of sale for the duration support is provided. The number of demand activators at each level of sale across all three performance levels during the policy period is aggregated in the "DAs active in the policy period" (Figure 17); and the actual number of toilets sold every month by all active sales agents in that month during the policy period is aggregated in the "Monthly sales in the policy period" sheet (Figure 18).

Figure 17: Total active DAs (policy period)

	A	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
2	Average monthly	# of Demand Activators per calendar month																					
3	toilets sales/ DA	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
4	0	27																					
5	1	27																					
6	2	51	13	13	12	13	12	13	12	13	12												
7	3					22	44	44	30	16	15												
8	4	28	28	10	10	9	10	9	10	9	10												
9	5																						
10	6																						
11	7																						
12	8	10	10	3	25	25	25	11	11	10	11												
13	9							22	22	22	8												
14	10										22												
15	11	22	22	22	8	8	7	8	7	8	7												
16	12																						
17	13																						
18	14			22	22	22	8	8	7	8	7												
19	15								22	44	44												
20	16	9	31	31	24	10	10	10	11	10	11												
21	17																						
22	18																						
23	19																						
24	20																						
25	21																						
26	22																						
27	23		9	9	9	2	2	2	3	3	3												
28	24																						
29	25																						
30	26																						
31	27																						
32	28			9	9	9	2	2	2	3	3												
33	29																						
34	30																						
35	31																						
36	32				9	9	9	2	2	2	3												
37	33																						
38	34					9	9	9	2	2	2												
39	35																						
40	36						9	9	9	2	2												
41	37							9	18	18	11												
42	38									9	18												
43	39																						
44	40																						
45	41																						
46	42																						
47	43																						
48	44																						
49	45																						
50	46																						
51	47																						
52	48																						
53	49																						
54	50																						
55	# Active DAs	174	113	119	128	138	147	158	168	179	189	0	0	0	0	0	0	0	0	0	0	0	0

Sheet name as per attached demand activation base model: "DAs active in policy period"

Figure 18: Total sales by all active demand activators (policy period)

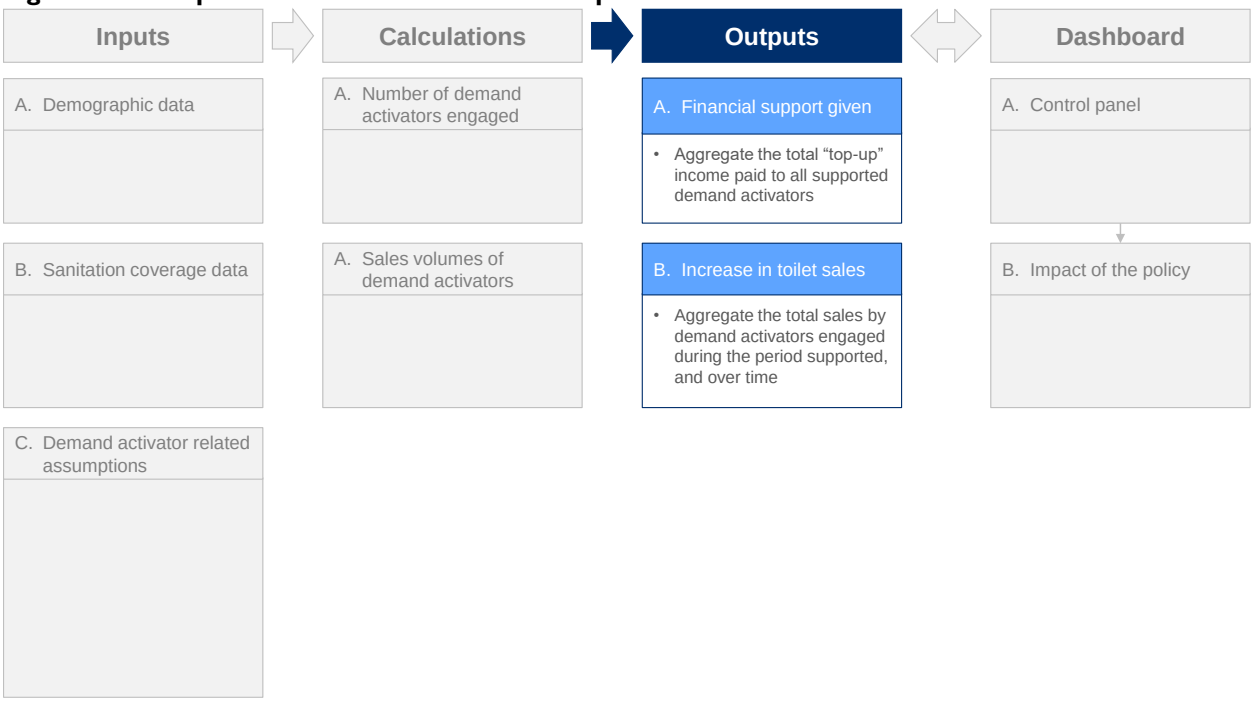
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
2	Average monthly	# of toilets sold per calendar month																							
3	toilets sales/ DA	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
4	0																								
5	1		27	27																					
6	2	76	76	102	26	26	24	26	24	26	24	26	24												
7	3							66	132	132	90	48	45												
8	4		112	112	112	40	40	36	40	36	40	36	40												
9	5																								
10	6																								
11	7																								
12	8		80	80	80	24	200	200	200	88	88	80	88												
13	9									198	198	198	72												
14	10												220												
15	11			242	242	242	88	88	77	88	77	88	77												
16	12																								
17	13																								
18	14					308	308	308	112	112	98	112	98												
19	15										330	660	660												
20	16			144	496	496	384	160	160	160	176	160	176												
21	17																								
22	18																								
23	19																								
24	20																								
25	21																								
26	22																								
27	23				207	207	207	46	46	46	69	69	69												
28	24																								
29	25																								
30	26																								
31	27																								
32	28					252	252	252	56	56	56	84	84												
33	29																								
34	30																								
35	31																								
36	32						288	288	288	64	64	64	96												
37	33																								
38	34							306	306	306	68	68	68												
39	35																								
40	36								324	324	324	72	72												
41	37									333	666	666	407												
42	38											342	684												
43	39																								
44	40																								
45	41																								
46	42																								
47	43																								
48	44																								
49	45																								
50	46																								
51	47																								
52	48																								
53	49																								
54	50																								
55	Total monthly sales	76	295	707	1,163	1,595	1,791	1,776	1,765	1,969	2,368	2,773	2,980	-	-	-	-	-	-	-	-	-	-	-	-

Sheet name as per attached demand activation base model: "Monthly sales in the policy period

3.3.3 Outputs of the base model

In order to serve as a tool to support decision making, the demand activation base model provides stakeholders with an assessment of both the benefits and the costs that could arise from enforcing the chosen policy lever. As seen in Figure 19, the outputs of the base model have accordingly been split into two: financial support given; and increase in toilet sales. Taken together, details of the increase in toilet sales and the costs can help stakeholders determine whether the policy lever should be enforced or not. Both outputs have been displayed in the "Financial support given to DAs" sheet in the base model (see Figure 20)

Figure 19: Components of the base model – outputs



In Figure 20, there are six broad blocks of figures:

The first block (see the green box in Figure 20) is a sum of all the sales agents who are active in each calendar month during the policy period (hence the table is populated only till month 12). In each month, the total number of active sales agents is disaggregated by the number of agents whose sales fall into commission slab 1 (sale of 0-4 toilets a month), those that fall into commission slab 2 (5-9 toilets a month); and those that fall into commission slab 3 (more than 10 toilets a month). These numbers are imported from the "DAs active in the policy period" sheet (Figure 17). A formula is used that adds the number of demand activators in each column of the sheet shown in (Figure 17) that have sales within the particular commission slab. For example, the number of sales agents active during month 6 and selling in commission slab 1 is calculated by adding cells "G4" to "G8" in Figure 17. Similarly, the number active in month 6 and selling in commission slab 2 is the sum of cells "G9" to "G13." The final category is sales agents active in month 6 whose sales fall in commission slab 3, but are under the minimum sales threshold; i.e., the sum of cells "G14" to "G33." Cells "G5," "G6," and "G7" in Figure 20 are where these sums are captured and displayed. Hence in month 6, there were a total of 119 sales agents (cell "G8") in Figure 20, of which 22 were from the sales agents who sold within commission slab 1, 25 were those that sold within commission slab 2, and 72 were those that sold within commission slab 3. Note, the sales agents selling in commission slab 3 and above the minimum threshold are not counted in this table as the assumption is that they do not require support.

Figure 20: Financial support to be given to demand activators

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	**Output: Financial support given to demand activators**																				
2		Calendar month																			
3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
4	Number DAs supported by the policy lever (# DAs/ month)																				
5	# DAs whose monthly sales fall in Slab 1	65	120	133	41	23	22	44	66	66	52	38	37								
6	# DAs whose monthly sales fall in Slab 2		10	10	10	3	25	25	25	33	33	32	19								
7	# DAs whose monthly sales fall in Slab 3			31	62	93	72	51	29	30	52	76	97								
8	Total # DAs supported	65	130	174	113	119	119	120	120	129	137	146	153								
11	Total monthly sales by supported DAs (# of toilets/ month)																				
12	Total number of toilets sold by DAs in Slab 1	76	215	241	138	66	64	128	196	194	154	110	109								
13	Total number of toilets sold by DAs in Slab 2		80	80	80	24	200	200	200	286	286	278	160								
14	Total number of toilets sold by DAs in Slab 3			386	945	1,505	1,239	854	451	462	806	1,173	1,384								
15	Total sales by supported Das	76	295	707	1,163	1,595	1,503	1,182	847	942	1,246	1,561	1,653								
18	Total income expectation of spported DAs (USD/ month)																				
19	Income expected by DAs whose sales fall in Slab 1	4,485	8,280	9,177	2,829	1,587	1,518	3,036	4,554	4,554	3,588	2,622	2,553								
20	Income expected by DAs whose sales fall in Slab 2		690	690	690	207	1,725	1,725	1,725	2,277	2,277	2,208	1,311								
21	Income expected by DAs whose sales fall in Slab 3			2,139	4,278	6,417	4,968	3,519	2,001	2,070	3,588	5,244	6,693								
22	Commissions earned by supported DAs (USD/ month)																				
23	Commission earned by DAs selling in Slab 1	114	323	362	207	99	96	192	294	291	231	165	164								
24	Commission earned by DAs selling in Slab 2		144	144	144	43	360	360	360	515	515	500	288								
25	Commission earned by DAs selling in Slab 3			888	2,174	3,462	2,850	1,964	1,037	1,063	1,854	2,698	3,183								
26	"Top up" support given to DAs by the government (USD/ month)																				
27	Support given to DAs selling in Slab 1	4,371	7,958	8,816	2,622	1,488	1,422	2,844	4,260	4,263	3,357	2,457	2,390								
28	Support given to DAs selling in Slab 2		546	546	546	164	1,365	1,365	1,365	1,762	1,762	1,708	1,023								
29	Support given to DAs selling in Slab 3			1,251	2,105	2,956	2,118	1,555	964	1,007	1,734	2,546	3,510								
30	Total support given by the government (USD/ month)	4,371	8,504	10,613	5,273	4,607	4,905	5,764	6,589	7,033	6,853	6,711	6,922								
31	Yearly support given (USD)												78,144								
32	Total number of toilets built (#) - includes those no longer supported												20,613								
33	Number of toilets built directly as a result of the policy lever (#)												12,770								
34	Number of toilets built indirectly as a result of the policy lever (#)												7,843								
35	Cost per toilet - direct toilets only (USD)												6.1								
36	Cost per toilet - including direct and indirect toilets (USD)												3.8								

Sheet name as per attached demand activation base model: "Financial support given to DAs"

The second block of figures (the yellow box in Figure 20) is a sum of the total number of toilets sold within each commission slab every month. This is calculated by adding the number of toilets sold in each column of the sheet shown in (Figure 18). For example, the total toilets sold in month 6 in commission slab 1 is calculated by adding cells "G4" to "G8" in Figure 17. Similarly, the total number of toilets sold in month 6 in commission slab 2 is the sum of cells "G9" to "G13." The final category is the total toilets sold in month 6 in commission slab 3, but under the minimum sales threshold; i.e., the sum of cells "G14" to "G33." Cells "G12," "G13," and "G14" in Figure 20 are where these sums are captured and displayed. Hence in month 6, there were a total of 1,503 toilets sold, of which 64 were toilets sold in commission slab 1, 200 toilets were sold within commission slab 2, and the balance 1,239 toilets were sold within commission slab 3, but under the minimum sales threshold.

The third and fourth blocks are found in the purple box in Figure 20. The first part of this block estimates the cumulative income expected by all active demand activators each calendar month. This is determined by multiplying the cells in the green box in Figure 20 by the minimum income expected from toilet sales (as set by the user in the "Dashboard" sheet). This provides the user with a sense of the total amount those sales agents expect to earn a month. From this we subtract the actual monthly income earned by these sales agents through commissions (this is the second part of the table in the purple box. The commission amount earned is calculated by multiplying the total toilet sales in the yellow box, with the commission for the slab in which those toilets were sold. For example, in month 6, sales agents selling in slab 1 expect an income of USD 1,518 ("G19"), but the income they actually earn through commissions in month 6 is USD 96 ("G23").

The fifth block (the blue box in Figure 20) calculates the actual amount of support to be given to sales agents. This is done by subtracting the income from commissions in each month from the minimum income expected by the sales agents in a month. For example, in month 6, the support given to sales agents with poor sales is equal to USD 1,422 (cell "G27"), which is the difference between the USD 1,518 expected by sales agents in month 6 (cell "G19") and the commissions paid to sales agents that month, i.e., USD 96.

The sixth and final block (the red box in Figure 20) aggregates key outputs of the model and displays them at a yearly level. The outputs summarized in this fashion include"

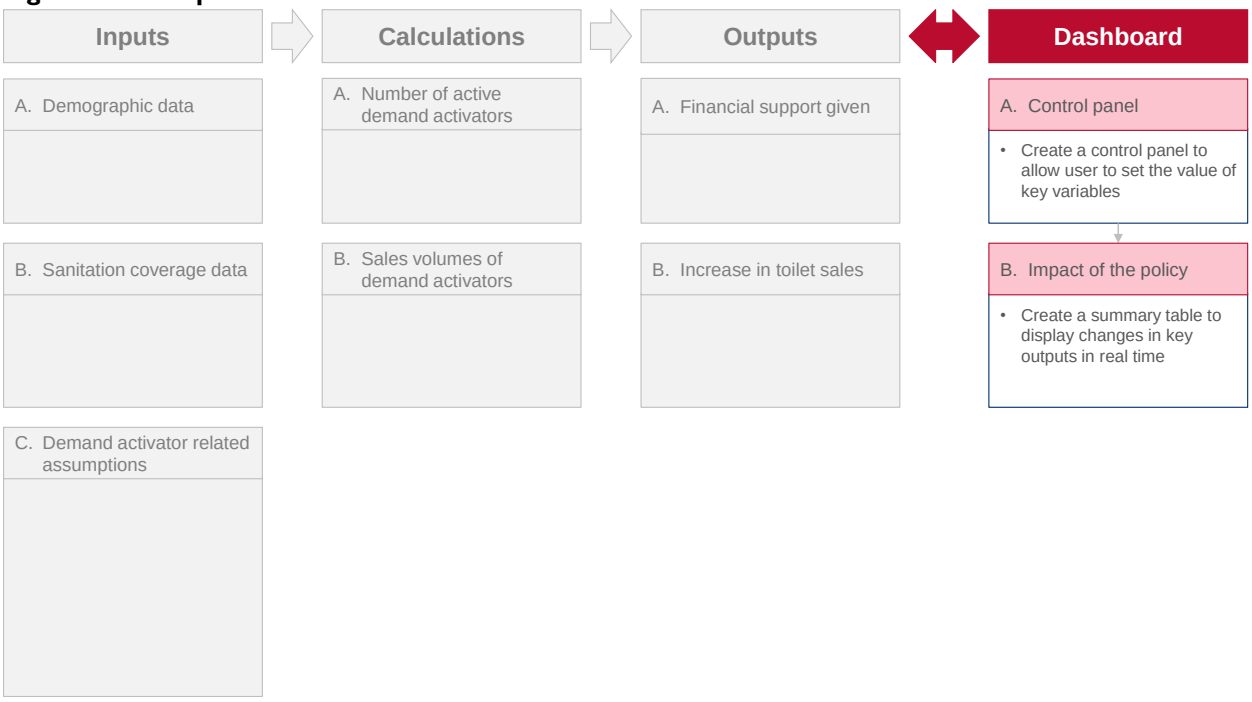
- Yearly support given (USD) – "Row 31"
- Total number of toilets built (#) - includes those no longer supported – "Row 32"
- Number of toilets built directly as a result of the policy lever (#) – "Row 33"
- Number of toilets built indirectly as a result of the policy lever (#) – "Row 34"
- Cost per toilet - direct toilets only (USD) – "Row 35"
- Cost per toilet - including direct and indirect toilets (USD) - "Row 36"

The "Financial support given to DAs" sheet automatically reduces, or increases, the number of rows that are hidden depending on the number of months for which the policy is provided.

3.3.4 User dashboard created for the base model

In order to allow the user to vary key variables that directly influence the outputs of the model, and to display the outputs of the model in an easy-to-understand manner, a user dashboard was created (Figure 21).

Figure 21: Components of the base model – user dashboard



From Figure 21, it can be seen, that the user dashboard has two components:

A. Control panel:

The dashboard was constructed to **allow users to easily update the value of the key variables** in order to see the impact this has on the outputs. Changing the value of these key variables will update the outputs in real-time. Figure 22 shows the "Control panel" in the "Dashboard" sheet that can be found in the accompanying base model. The key variables that the control panel allows the user to modify are:

- The total income potential demand activators expect from all income-generating activities
- The percentage of time spent by demand activators on selling toilets
- The total income from selling toilets expected by potential demand activators
- The commission amount to be paid to the demand activators
- The percentage of the target market to be covered under the policy
- The number of households/ settlements in the sales territory of one demand activator
- The percentage of demand activators expected to have stable, average, and poor sales
- The duration (in months) for which the government provides "top-up" support

Figure 22: Control panel in the "Dashboard" sheet of the base model

	A	B	C	D	E	F
3	**Control Panel**					
4		Minimum income guarantee		Year 1	Year 2	Year 3
5	Details of government support	Total expected income/ month (USD)		230	230	230
6		Percentage of time spent by demand activators on selling toilets (%)		30%	30%	30%
7		Minimum income guaranteed from selling toilets (USD)		69	69	69
8		Commission Slabs		Year 1	Year 2	Year 3
9		Commission for DAs who sell in the bottom slab - Slab 1 (USD)		1.50	1.50	1.50
10		Commission for DAs who sell in the middle slab - Slab 2 (USD)		1.80	1.80	1.80
11		Commission for DAs who sell in the top slab - Slab 3 (USD)		2.30	2.30	2.30
12		Capacity of demand activators		Year 1	Year 2	Year 3
13		Percentage of villages (rural) in target market that the policy will cover		50%	50%	50%
14		Percentage of towns (urban) in the target market that the policy will cover		10%	10%	10%
15		Number of households covered by one demand activator		7,000	5,000	3,500
16		Constraints		Stable DAs	Average DAs	Poor DAs
17		Percentage of demand activators by level of sales		20%	50%	30%
18		Attrition rate of demand activators		5%	20%	50%
19		Number of Months for which the government supports DAs (#)		12	12	3

Sheet name as per attached Demand Activation base model: "Dashboard"

B. Impact of the policy

The blue "impact of the policy" table shown in Figure 23 is where the outputs are updated depending on the values set in the control panel. In order to effectively support analysis and decision making, the dashboard provides only the most relevant information in a way that is easy to read and understand. Therefore, this sheet focuses only on: the number of toilets sold by sales agents – both directly during the policy period, and indirectly over the entire model period; the change in sanitation coverage; and the cost to the government in terms of total cost as well as the per toilet cost.

Figure 23: Impact of the policy table in the "Dashboard" sheet of the base model

	A	B	C	D	E	F
20						
21	**Impact of the policy**					
22			Total	Year 1	Year 2	Year 3
23	Change in sanitation coverage	Total toilet sales (#)	1,31,657	20,613	44,885	66,159
24		Toilets sales directly as a result of the policy lever (#)	12,770	12,770	-	-
25		Existing sanitation coverage (at least basic) (%)		29.4%	29.8%	30.7%
26		New sanitation coverage - including direct and indirect toilets (%)		29.8%	30.7%	32.1%
27		**Increase in sanitation coverage - including direct and indirect toilets (%)**	**2.8%**	**0.4%**	**0.9%**	**1.4%**
28						
29	Cost-benefit to the government	Total cost to government across demand activators (USD)	78,144	78,144	-	-
30		**Cost per toilet - direct toilet sales only (USD)**	**6.1**	**6.1**	-	-
31		**Cost per toilet - including direct and indirect toilets (USD)**	**0.6**	**3.8**	-	-

Sheet name as per attached demand activation base model: "Dashboard"

4.0 ADAPTING THE BASE MODEL

In this chapter, we discuss the different contexts in which the demand activation model can be applied, as well as the minimum data required to apply it to another geography/ market. We then describe how each component of the model (inputs, assumptions, mathematical equations, outputs, and user dashboard) can be modified for other markets.

4.1 APPLICABILITY AND DATA REQUIRED

MBS is based on the premise that customers' demand for toilets exists and suppliers from the private sector are willing to fulfill that demand. The demand activation model aims to estimate how the number of toilets sold can be improved by supporting a cadre of demand activators. This is based on research that shows demand activation plays an important role in converting the initial interest of households into actual toilet purchases. However, **the implicit assumption in the model is that the provision of the toilets to meet this activated demand will be through existing private sanitation enterprises**. Further, these enterprises are willing to pay the demand activators a commission for their services. Also, as mentioned earlier, an MBS implementer may be needed to take on the recruitment, training, monitoring, and overall management of the demand activators; the government's support is limited to offering a minimum income "top-up" guarantee. Therefore, there are minimum contextual conditions that need to be met for the model to be applied:

- **Demand for toilets exists:** The model is based on the assumption that demand exists, but needs to be unlocked. If households do not feel there is any need for sanitation in the first place, demand generation activities rather than demand generation may be required
- **A functioning sanitation market exists:** This means that there is a sufficiently large pool of customers to make private provision of sanitation viable; that private sanitation entrepreneurs are present in the market; and that there are no major obstacles (physical or policy-related) that prevent these entrepreneurs from supplying toilets in the target geography/ market
- **An MBS implementer is willing to identify, recruit, train, and monitor demand activators**: As mentioned, the whole process of setting up a demand activation mechanism requires significant time and financial investments. The modeled policy estimates the potential benefits of the government bearing part of the financial costs involved; however, the other functions mentioned above need to be performed by an interested third party
- **Sanitation entrepreneurs exist and are willing to pay commissions to demand activators**: Under the modeled policy, the government only provides "top-up" support if a demand activator's income from commissions is insufficient to meet his/ her minimum income expectations. However, the actual commission amount still needs to be covered by someone; ideally the sanitation entrepreneur
- **Stable economic and political environment:** A certain amount of economic and political stability is required for any policy to be implemented effectively. This model does not take into account the effect of political or economic instability, and or any kind of conflicts as it is difficult to predict how these could affect implementation

Further, the policy modeled aims to increase toilet sales amongst those households who do not have access to adequate sanitation facilities. Therefore, it is important to be able to identify the number of households in the target market and the type of sanitation facility they possess. Finally, to determine the number of demand activators required, and the quantum of support to be provided to them, data is required related to the number of settlements in the target market.

It would not be possible to adapt the demand activation model to a geography/ market where these conditions and/ or data do not exist. If the model was to be applied to a geography/ market where these conditions are not met, the predictions arising from the model would be purely speculative and not grounded in reality. Therefore, before attempting to apply this model to other markets, we strongly recommend that the user check for the existence of these conditions and the availability of the required data.

4.2 VARIATIONS SUPPORTED

The description of the underlying logic of the demand activation base model, and the process of creating it as detailed in the previous chapter, should help readers understand how to construct similar models for other market rules that they wish to study. However, users may be interested in applying a variation of the policy lever as described to another geography/ market. In this case, the user can choose to adapt the base model itself rather than create a completely new model. The subsequent subsections in this chapter provide a step-by-step guide to doing this.

As the model is built to estimate the results of supporting a potential cadre of demand activators, and not an existing one, it has been kept fairly open-ended. Hence, the model can support a number of variations including:

- Change in the expected performance levels of different demand activators
- Changes in the sales trajectories and attrition rates of these demand activators
- Changes in the commission slabs and amounts
- Changes in the duration for which support is given

However, the model cannot estimate the cost and benefit of a policy wherein the support given is non-monetary in nature.

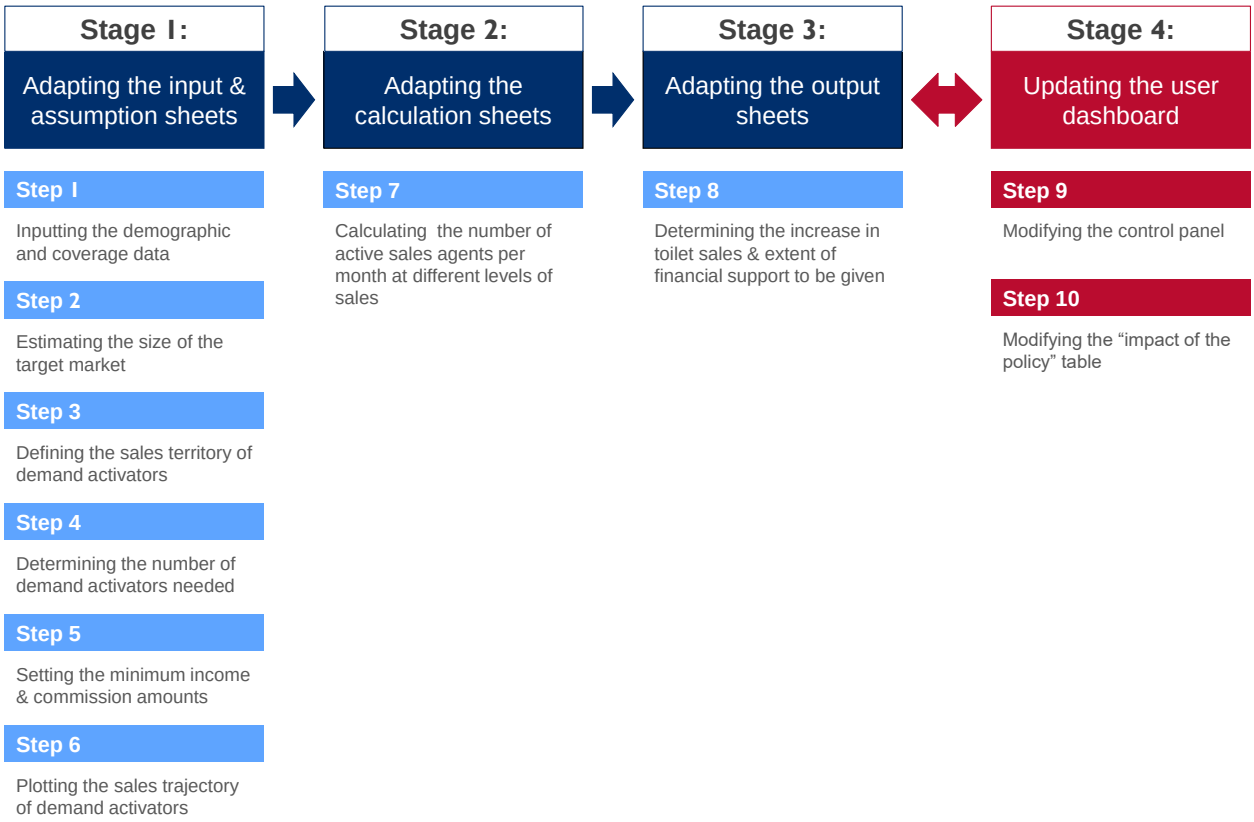
4.3 PROCESS OF ADAPTING THE BASE MODEL

Figure 24 provides a snapshot of the process to be followed in adapting the base model to a different geography/ market. The process has been broken down into ten steps spread across four stages. These stages are aligned to the schematic of the base model introduced in Figure 4 in subsection 3.3. The four stages have been summarized below:

- **Stage 1: Adapting the inputs and assumption sheets –** The first stage is to collect and input all relevant demographic data, sanitation coverage data, and to detail out the assumptions needed to estimate the number of demand activators required, and their sales trajectories. **Steps 1 – 6** as seen in Figure 24 deal with how to identify and select the relevant data, and how to analyze, consolidate, and enter it into the model
- **Stage 2: Adapting the calculation sheets –** The second stage (**Step 7)** is to adapt the calculation sheets of the base model. This step explains the formulae that have been used to convert the input data into outputs using the key assumptions entered in the input sheets. The reader is guided through the modifications that may be required to either the input data or the formulae in the calculation sheets in order to arrive at the desired outputs
- **Stage 3: Adapting the output sheets –** The third stage (**Step 8)** describes how to display the outputs calculated in Stage 2 (both sanitation toilet sales and financial costs)
- **Stage 4: Updating the user dashboard –** The final stage is updating the user dashboard. **Steps 9** elaborates on how the control panel has been linked to other sheets in the model, and

describes the modifications that need to be made to it. **Finally, Step 10** describes the process of updating the "impact of the policy" table so that it reflects the other changes made in the model

Figure 24: Steps to be followed in adapting the base model



4.3.1 STAGE 1: ADAPTING THE INPUTS AND ASSUMPTION SHEETS

Step 1: Inputting the demographic and coverage data

Once the user has ascertained that prerequisite contextual conditions for applicability of this model, as detailed in Section 4.1, exist and that the necessary data required is available, the first step to adapting the model is determining who is to be targeted by the policy lever. In order to do this, the user needs to be able to identify the size of the population in the selected geography and sanitation coverage levels. This data needs to be entered by the user in the "General Inputs" sheet of the base model (see Figure 25).

- **Determine the total number of households in the selected geography:** The user needs to collect population data at the household level, given that it is assumed that toilet purchase decisions occur at the household level. In case, household-level population data is not available, the user will have to assume an average household size to estimate the number of households in the target market (as seen in the base model; Figure 25, C5:C7). Population data should be readily available from secondary sources such as government census studies, government national sample surveys, or databases of international organizations (for e.g., World Bank). It is recommended that multiple sources are evaluated in order to find the data that is most up to date. If the user wishes to apply the policy to specific geographic divisions (e.g., to rural vs.

urban areas), the population data should also be disaggregated by these geographic units. In the base model, it was decided to segment Bihar's population by rural vs. urban areas. The manner in which this household data was determined and inputted in the base model can be seen in the red box of Figure 25. The total population in terms of number of individuals was entered into the model in "Row 4." This State-level data ("C4") was split into urban population ("D4") and rural population ("E4"). The mean household size was also entered at each of the three levels; i.e., at the State-level ("C5"), urban level ("D5"), and rural level ("E5"). Dividing the population data in "Row 4" by the mean household sizes in "Row 5," we arrived at the number of houses at the State-level ("D6"), urban level ("E6"), and rural level ("F6").

- **Classify the households according to the type of sanitation facility they have access to:** In order to determine the actual size of the target market, we needed to identify the number of households without access to adequate sanitation facilities in the selected geography. The policy levers in this model are aimed at increasing coverage amongst households that either do not have access to sanitation facilities, or have unimproved sanitation facilities as per the UNICEF/ WHO Joint Monitoring Program (JMP) definition. The base model relied on JMP data to determine the number of houses with different types of sanitation facilities; however, other sources can also be used, e.g., government census studies, or government national sample surveys which capture health-related data. JMP classifies access to sanitation facilities into the following categories: at least basic access (improved facilities); limited access (improved facilities that are shared); access to unimproved facilities; and open defecation (no access). The JMP data provided details of the percentage of individuals with access to these different facilities (see Figure 25; "Row 11" to "Row 14"). The respective coverage rates were then multiplied against the respective total household sizes to arrive at the number of households that fall into each category ("Row 16" to "Row 19"). As the JMP defines only those with "at least basic" sanitation as having improved facilities, households with unimproved, limited and no sanitation facilities were clubbed into one category and labeled as unimproved sanitation (see "Row 22" in Figure 25). The sanitation coverage data was also split by urban ("Column D") and rural ("Column E")

Figure 25: Demographic and sanitation coverage data

	A	B	C	D	E
1	General Inputs				
2		Inputs	Data		
3	Demographic data		Total	Urban	Rural
4		Total Population	2,89,20,888	72,38,922	2,16,81,966
5		Mean Household Size	6.1	6.0	6.1
6		Number of Households	47,60,908	12,06,487	35,54,421
7		Number of HHs per town/ village		11,042	581
8		Number of towns/ villages		109	6,118
10	Sanitation coverage data	Sanitation coverage (%)	Total	Urban	Rural
11		At least basic	29.37%	54.90%	20.70%
12		Limited (shared)	8.38%	19.80%	4.50%
13		Unimproved	2.06%	3.40%	1.60%
14		Open defecation	60.20%	21.90%	73.20%
15		Sanitation coverage (# HHs)	Total	Urban	Rural
16		At least basic	13,98,126	6,62,361	7,35,765
17		Limited (shared)	3,98,833	2,38,884	1,59,949
18		Unimproved	97,892	41,021	56,871
19		Open defecation	28,66,057	2,64,221	26,01,836
20		Classifying HHs by level of service (#)	Total	Urban	Rural
21		Improved sanitation	13,98,126	6,62,361	7,35,765
22		Unimproved sanitation (including open defecation)	33,62,782	5,44,126	28,18,656

Sheet name as per attached demand activation base model: "General Inputs"

When adapting the model to another geography/ market, the user needs to arrive at the number of households with improved versus unimproved sanitation. If the data is already available at the household level, it can be directly entered without first determining the population in terms of number of individuals. The user can delete the redundant "Row 4" and "Row 5." Similarly, if the user does not wish to differentiate between geographic areas, data only needs to be entered in "Column C" while "Column D" and "Column E" can be deleted. While removing any rows or columns, it is possible that certain cells display the "#REF!" error. This error arises when a formula cannot reference a parent cell, possibly due to its deletion. A user should ensure that they substitute the appropriate inputs in case of such an error before moving to Step 2.

Step 2: Estimating the size of the target market

The model attempts to estimate the change in toilet sales that could arise if demand activators were supported. It implies that the demand activation mechanism does not presently exist and the user will have to define the size of the target sanitation market. The process of estimating the size of the target market will involve the user to make certain assumptions about the intended scale of the demand activation mechanism, i.e., the size of the geographic area targeted in the policy.

For our base model, we assumed that the government will introduce the policy in only a few urban and rural settlements. To arrive at the exact percentages, we relied upon the size of the target market in PSI's 3SI program. This was done so that we could cross-check the outputs of the model against actual metrics of the 3SI program. In the area covered by the PSI intervention in Bihar, there were a total of 6,118 villages and 109 towns. In our base model, we assumed that the policy would be implemented in 50% of all villages and 10% of all towns, i.e., in ~3,058 villages and ~11 towns (see green box in Figure 26).

While our base model uses the target market size of the 3SI intervention, a user can change the scale of the intervention when adapting the model to another geography/market. This change can be made by the user by modifying the coverage area of the policy in "Row 13" and "Row 14" of Figure 26. Additionally, users can also vary the scope of the geographic area over the intended years of the targeted policy lever by changing the inputs made across "Column D" to "Column F" in "Row 13" and "Row 14."

Figure 26: Size of target market

	A	B	C	D	E	F
1	Dashboard					
12	Details of government support	Capacity of demand activators		Year 1	Year 2	Year 3
13		Percentage of villages (rural) in target market that the policy will cover		50%	50%	50%
14		Percentage of towns (urban) in the target market that the policy will cover		10%	10%	10%
15		Number of households covered by one demand activator		7,000	5,000	3,500

Sheet name as per attached demand activation base model: "Dashboard"

Step 3: Defining the sales territory of demand activators

The next step to adapting the model for a new geography/market is to define the average sales territory of one demand activator. Defining the sales territory of the demand activators, along with the total target market size, helps estimate the total number of demand activators required to cover the defined target market of the intervention (covered further in Step 4).

In our base model, we used data from the 3SI intervention to estimate the number of villages and households a single demand activator can cover on average. In the 3SI intervention, one demand activator covered ~12 villages on average, which translates into ~6,972 households (according to the Census of India – 2011, on average there are 581 households per village in PSI areas).

While we assumed the sales territory of a typical demand activator in Bihar, a user should input the number of households they expect a single demand activator to cover across the years of the intervention in their intended geography/market (see red box in Figure 26).

Additionally, in the base model we assumed that the number of demand activators will increase each year, as each year more demand activators will get attracted to the market due to government support. This assumption has been captured by reducing the sales territory of a demand activator over the years, as the number of households a single demand activator can service will decline if there is a rise in the number of demand activators. In the context of PSI's 3SI intervention the households covered by a demand activator declined from 7,000 in Year I to 3,500 by Year III. If a user wishes to include this assumption, the number of households covered by a single demand activator should reduce over the years of the program. This change can be made by modifying "Columns D" to "Column F" of "Row 15" of Figure 26 (see red box).

Step 4: Determining the number of demand activators needed

After we have defined the size of our target market and the sales territory covered on average by a demand activator, we can determine the number of demand activators that will be required in the policy intervention.

In the base model, the calculation for the number of demand activators required for the policy intervention is calculated in sheet "General Inputs" (see green box in Figure 27). In "Row 26" and "Row 27," we have defined the sales territory of the demand activators in terms of villages and towns covered. This has been calculated as total households in a village and town divided by the number of households covered by one demand activator. In the base model, no additional inputs are required for this calculation as the inputs have already been entered by the users.

In the base model, the calculation for the number of demand activators required for the policy intervention is calculated in sheet "General Inputs" (see red box in Figure 27).

This is calculated as

$$DA(\#) = \frac{TM * \ \%\ of\ TM\ covered}{D1}$$

Where,

DA(#) = Number of demand activators
TM = Size of the target market (in villages and towns)
% of TM covered = Percentage of target market covered in the policy intervention

D1 = Average sales territory of demand activator (in villages and towns)

Figure 27: Number of demand activators required

	A	B	C	D	E
1	General Inputs				
24	Demand activator data	Number of demand activators required			
25			Year 1	Year 2	Year 3
26		Number of villages covered by 1 Demand Activator	12	9	6
27		Number of towns covered by 1 Demand Activator	0.6	0.5	0.3
28		Percentage of villages targeted	50%	50%	50%
29		Percentage of towns targeted	10%	10%	10%
30		Number of Rural Demand Activators required	255	340	510
31		Number of Urban Demand Activators required	17	24	34
32		Total number of Demand Activators required	272	364	544

Sheet name as per attached demand activation base model: "General Inputs"

In the base models, we have assumed that demand activators perform the function of sales at varying levels of success. The performance level of demand activators refers to the percentage of sales agents that are expected to achieve strong vs. poor sales. Based on a historical analysis of PSI's data, we realized that demand activators could be divided into three categories:

i. Demand activators with stable sales – these demand activators see increasing sales month-on-month until the number of toilets sold in a month plateaus at a level that is above the minimum sales threshold needed to earn the minimum expected income

ii. Demand activators with average sales – these demand activators see slowly rising month-on-month sales initially, and then have fairly consistent sales but within a range that is lower than the minimum sales threshold required to earn the minimum expected income

iii. Demand activators with poor sales – these demand activators are never consistently engaged in selling toilets and ultimately act as passive and opportunistic players who sell toilets whenever people approach them or demand is high (e.g., post-harvest)

In our base model, we defined them such that demand activators with stable sales were the smallest percentage of the total sales agents, with the majority being concentrated in the average and poor sales category. In the base model, the user can determine the percentage of sales agents that are expected to fall into each of these categories (see the green box in Figure 28) by entering it in "Row 17" of the sheet "Dashboard." This breakdown also gets reflected in "Row 33" to "Row 35" in Figure 28 (see yellow box).

In the base model, we have assumed that a certain attrition rate of demand activators, i.e., a percentage of recruited demand activators drops off from the intervention and ceases to sell toilets. It is assumed that all demand activators recruited would stay engaged for at least two months, but from the first month onwards a certain percentage of the demand activators recruited will drop out. Further, it is assumed that more demand activators with poor sales will drop out than those with average sales or stable sales (see the yellow box in Figure 28). The user can update the value of demand activators expected to drop out in "Row 18" of the sheet "Dashboard."

Figure 28: Performance levels and attrition rate of demand activators

	A	B	C	D	E
24	Demand activator data	Number of demand activators required			
25			Year 1	Year 2	Year 3
33		% of DAs with stable sales	20.00%		
34		% of DAs with average sales	50.00%		
35		% of DAs with poor sales	30.00%		
36		# of required DAs with stable sales	*54*	*73*	*109*
37		# of required DAs with average sales	*136*	*182*	*272*
38		# of required DAs with poor sales	*82*	*109*	*163*
39		Attrition rate of DAs with stable sales (every three months)	*5%*		
40		Attrition rate of DAs with average sales (every three months)	*20%*		
41		Attrition rate of DAs with poor sales (every three months)	*50%*		
42		**# of DAs recruited**	***391.00***	***523.00***	***781.00***
43		# of recruited DAs with stable sales	*57.00*	*77.00*	*115.00*
44		# of recruited DAs with average sales	*170.00*	*228.00*	*340.00*
45		# of recruited DAs with poor sales	*164.00*	*218.00*	*326.00*

Sheet name as per attached demand activation base model: "General Inputs"

Step 5: Setting the minimum income & commission amounts

The minimum income is defined as the minimum income from all income-generating activities that a potential demand activator expects to earn. In the base model, we did this based on the salary of full-time demand activators that PSI engaged at the start of the 3SI program. While PSI later moved to a model in which sales agents sold toilets only part-time, the total salary expected was based on the earlier figure of USD 230 a month. Further, it was assumed that the part-time demand activators would spend ~30% of their time selling toilets, and hence, the minimum expected income from toilet sales is USD 69 (see green box in Figure 29). The user can change these inputs in "Row 5" and "Row 6" of the sheet "Dashboard" if required.

The user will also have to define the commission paid per toilet when adapting the model to a new market/geography. The commission paid per toilet refers to the amount per toilet that the entrepreneur pays demand activators for their services. For the base model, we used the commission amount that the 3SI program uses. Under the 3SI program, the commission amount is contingent on the number of toilets sold.

- **i.** Slab 1 (For 0-4 toilets sold per month) – Commission amount of USD 1.50 per toilet per demand activator
- **ii.** Slab 2 (For 5-9 toilets sold per month) – Commission amount of USD 1.80 per toilet per demand activator
- **iii.** Slab 3 (For greater than 10 toilets sold per month) – Commission amount of USD 2.30 per toilet per demand activator

The purpose of varying bands of commission is to incentivize sales agents to try and sell a greater number of toilets. The user can update the commission amounts in "Row 9" to "Row 11" of the sheet "Dashboard." These values are also reflected in the "General Inputs" sheet (see purple box in Figure 29).

In case the user wants to update the limits of the sales performance slabs of the demand activators, the same can be done by adjusting the lower limits of the slabs in "Row 6oto "Row 68" of the sheet "General Inputs."

Figure 29: Minimum income assumptions

	A	B	C	D	E
54		Remuneration of demand activators			
55			Year 1	Year 2	Year 3
56		Expected income/ month from all income generating activities (USD)	230	230	230
57		Average % of time dedicated to toilet sales	30%	30%	30%
58		Minimum expected income (USD)	*69*	*69*	*69*
59		Commission/ toilet for Slab DAs whose monthly sales fall in 1 (USD)	1.50	1.50	1.50
60		Commission/ toilet for DAs whose monthly sales fall in Slab 2 (USD)	1.80	1.80	1.80
61		Commission/ toilet for DAs whose monthly sales fall in Slab 3 (USD)	2.30	2.30	2.30
62		Commission/ toilet for DAs whose monthly sales exceed the minimum threshold (USD)	2.30	2.30	2.30
63		Commission slabs			
64		Slab	Minimum number of toilets sold in a slab		
65			Year 1	Year 2	Year 3
66		Slab 1	-	-	-
67		Slab 2	5	5	5
68		Slab 3	10	10	10
69		Sales threshold (# of toilets/ month)	*30*	*30*	*30*

Sheet name as per attached demand activation base model: "General inputs"

In addition, the user will also need to update the minimum sales threshold. The minimum sales threshold is defined as the number of toilets per month at which the income from sales commissions will equal the minimum income expected from selling toilets (USD 69). In the base model, this was performed by dividing the minimum income expected from toilet sales (USD 69) by the commission paid at the highest sales slab (USD 2.30). Therefore, for the base model, the minimum threshold set was 30 toilets. The user can change these figures in "Row 7" and "Row 11" in the sheet "Dashboard," and the output will be reflected in "Row 69" in sheet "General Inputs" (see yellow box in Figure 29).

Step 6: Plotting the sales trajectory of demand activators

In our base model, we have assumed that demand activators at different performance levels have different sales trajectories. As mentioned above, demand activators with stable sales see increasing month-on-month sales until it plateaus at a point higher than the minimum sales threshold; those with average sales see slowly rising sales that stay below the minimum threshold and with variation month-on-month; and those with poor sales see very low sales volumes and sell only sporadically. To model these trajectories, we have used different line formulae.

For those with stable sales, an exponential curve that plateaus at a particular point was used. To calculate the trajectory, the user needs to enter the highest volume of sales expected per month during the intervention (C47 in Figure 30) that is expected (the point at which point sales will plateau), the number of months it will take to achieve half the highest volume of sales (C48 in Figure 30); and the expected slope of the line (C49 in Figure 30). For demand activators with average sales, a sine curve formula is used, wherein the user needs to enter the average monthly sales expected (C52 in Figure 30) and the expected variance from this average (C53 in Figure 30). For those with poor sales, again the sine curve formula is used, but with a lower average sales figure (D52 in Figure 30) and a higher variance (D53 in Figure 30).

Figure 30: Sales trajectory of demand activators

	A	B	C	D	E
46	Demand activator data	Projected sales of demand activators with stable sales			
47		Highest toilet sales/ month over intervention lifetime	40	16	4
48		# months taken to achieve half of the highest sales	3.5		
49		Slope of sales trajectory	2.5		
50		Projected sales of demand activators with average and poor sales			
51			DAs with average sales	DAs with poor sales	
52		Mean toilet sales/ month over intervention lifetime	9	2	
53		Variance from mean toilet sales/ month	7	2	

Sheet name as per attached demand activation base model: "General inputs"

These assumptions taken together will inform how many demand activators are actively selling toilets every month, and the number of toilets they sell. In the blue box in Figure 31, we can see how the line equations inputted in lead to a month-wise sales figure. For example in "Row 19" the maximum value set of 40 (C47 in Figure 30), and in "Row 20" the average is 9 toiles sold per month over the 3 years, with the maximum being 16 toilets, and the minimum being 2 toilets due to the variance of 7 set in C53 in Figure 30.

A user should note that the sales trajectory shown in the blue box in Figure 30 represents the number of toilets sold by a demand activator in each month. However, the figure of 2 toilets in month 1 seen in cell "B19" of Figure 30 is not the number of toilets sold by a stable demand activator in the first calendar month, but the number sold in the first month a demand activator is active. Therefore every demand activator recruited (who is a stable performer) would sell 2 toilets in the first month he/she is active. Therefore, the 10 sales agents recruited in a calendar month (Cell "B4" in the green box in Figure 30) will sell 2 toilets in their first month, and the 3 sales agents recruited in the month 12 (cell "M4" in the green box in Figure 30) will also sell 2 toilets in their first month.

Figure 31: Active demand activators and their monthly sales

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK
2	Number of Demand Activators recruited/ calendar month																																				
3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
4	*Stable performers*	*10*	*10*	*10*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*2*	*1*	*2*	*2*	*1*	*2*	*2*	*1*	*2*	*2*	*1*	*2*	*3*	*4*	*3*	*3*	*3*	*3*	*4*	*3*	*3*	*3*	*3*	*3*
5	*Average performers*	*28*	*28*	*28*	*10*	*10*	*9*	*10*	*9*	*10*	*9*	*10*	*9*	*5*	*4*	*5*	*5*	*5*	*5*	*5*	*4*	*5*	*5*	*5*	*5*	*9*	*10*	*9*	*10*	*9*	*9*	*10*	*9*	*9*	*10*	*9*	*9*
6	*Poor performers*	*27*	*27*	*27*	*9*	*9*	*9*	*9*	*9*	*10*	*9*	*10*	*9*	*5*	*4*	*5*	*4*	*5*	*4*	*5*	*4*	*5*	*4*	*5*	*4*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*
7	Number of drop outs/ calendar month																																				
8		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
9	Stable performers			*1*	*1*	*1*	*1*	*1*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
10	Average performers			*6*	*6*	*6*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
11	Poor performers			*14*	*14*	*14*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*3*	*2*	*3*	*2*	*3*	*2*	*3*	*2*	*3*	*2*	*3*	*2*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*1*
12	Number of active DAs/ calendar month																																				
13		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
14	Stable performers	*10*	*20*	*29*	*31*	*33*	*35*	*37*	*39*	*42*	*45*	*48*	*51*	*53*	*54*	*56*	*58*	*59*	*61*	*63*	*64*	*66*	*68*	*69*	*71*	*74*	*78*	*81*	*84*	*87*	*90*	*94*	*97*	*100*	*103*	*106*	*109*
15	Average performers	*28*	*56*	*78*	*82*	*86*	*93*	*101*	*108*	*116*	*123*	*131*	*138*	*141*	*143*	*147*	*151*	*155*	*159*	*163*	*166*	*170*	*174*	*178*	*182*	*190*	*199*	*206*	*214*	*221*	*228*	*236*	*243*	*250*	*258*	*265*	*272*
16	Poor performers	*27*	*54*	*67*	*62*	*57*	*61*	*65*	*69*	*74*	*78*	*83*	*87*	*87*	*86*	*88*	*90*	*92*	*94*	*96*	*98*	*100*	*102*	*104*	*106*	*112*	*119*	*123*	*127*	*131*	*135*	*139*	*143*	*147*	*151*	*155*	*163*
17	Sales trajectory																																				
18		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
19	Stable performers	2	8	16	23	28	32	34	36	37	37	38	38	39	39	39	39	39	39	39	39	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
20	Average performers	2	4	11	16	14	8	3	3	9	15	15	10	4	2	7	14	16	12	5	2	5	12	16	14	7	2	4	10	15	15	9	3	3	8	14	16
21	Poor performers	-	1	2	3	4	4	4	3	2	1	1	-	-	-	1	2	3	4	4	4	3	2	1	-	-	-	1	2	3	4	4	4	3	3	2	1

Sheet name as per attached demand activation base model: "DA recruitment and sales inputs"

4.3.2 STAGE II: ADAPTING THE CALCULATION SHEETS

The focus of this section is on the mathematical calculations developed to calculate the aggregate number of sales agents engaged and the volume of sales that fall within each commission band.

Step 7: Calculating the number of active sales agents per month at different levels of sales

In order to determine, the total number of demand activators selling a particular number of toilets in a calendar month, four calculation sheets were prepared in the base model. These sheets are:

I, II & III - "Poor performing DAs," "Average performing DAs" and "Stable performing DAs"
They aggregate the number of demand activators active at each performance level who are active each month at each level of sales, i.e., the number of demand activators in their first month selling 2 toilets vs. number of demand activators in their sixth month selling 32 toilets

IV - "Total Active DAs"
This aggregates the total number of demand activators across all performance levels in one sheet who are active at each level of sales.

Each of the above sheets has two tables: One counts all the active demand activators at the respective performance level over the entire three year model period (only two years shown in Figure 32 due to constraints of space), while the other table (Figure 33) does the same, but only for the duration for which the government provides support ('policy period').

"Column B," in Figure 32 shows the sales trajectory of stable performing sales agents as defined in the "DA recruitment and sales input" sheet; while "Row 3" depicts each calendar month. The sales trajectory automatically updates to reflect the options set in the "DA recruitment and sales input" sheets and requires no interference from the user. The cells in the table display how many sales agents were active in a particular calendar month selling the number of toilets defined by the sales trajectory. For example, 3 active sales agents sold 2 toilets each in month 6 (cell "H44"); 2 active sales agents sold 16 toilets each in the same month (cell "H46"); and 9 active sales agents sold 32 toilets in that month ("Cell H49"). This is done for the whole three years that the model is constructed for.

The table in Figure 33 is a duplicate of that shown in Figure 32. The difference is that only the number of sales agents active in the first 12 months is shown in Figure 33, while the rest are blanked out. This is because in the base model, the duration of support for sales agents with stable sales ('policy period') has been set at 12 months (see cell "D19" in sheet "Dashboard"). A user may change the number of months for which support is provided by editing "Row 19" in the sheet Dashboard. Such a change will reflect in the table in Figure 33 will automatically by either hiding, or revealing more rows in accordance with user-defined setting. The reason for doing this is so that we can determine the number of sales agents who need to be paid the "top-up" support and the number of toilets sold that can be directly attributed to the support provided. The table on Figure 32 on the other hand is needed to see the total sales achieved due to sales agents being engaged by the policy lever, even after support is withdrawn. This allows us to assess the indirect effect of the policy.

The number of demand activators at each level of sale across all three performance levels is aggregated in the "Total active DAs" sheet (Figure 34). "Column A" in Figure 34 provides a count of possible toilet sales per month from 1 to 50, while "Row 3" depicts each calendar month. Each monthly column in this table contains a formula that matches the sales trajectories in the individual sales agents sheet (e.g., "Column B" in Figure 32) with the possible sales in each month ("Column A" in Figure 34). If the values in these columns match, the formula adds all the active sales agents in that month (from all three individual sales agent sheets) and displays it against the corresponding level of toilet sales. This aggregation of number of demand activators does not require any unique input from the user.

Figure 32: Number of active demand activators at each level of sale (model period)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
42			Total Number of Demand Activators per calendar month																							
43	Average monthly toilets sales/ DA		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
44	Sales by DAs in their **1st month**	**2**	10	10	10	3	3	3	3	3	3	3	3	3	2	1	2	2	1	2	2	1	2	2	1	2
45	Sales by DAs in their **2nd month**	**8**		10	10	10	3	3	3	3	3	3	3	3	3	2	1	2	2	1	2	2	1	2	2	1
46	Sales by DAs in their **3rd month**	**16**			9	9	9	2	2	2	3	3	3	3	3	3	2	1	2	2	1	2	2	1	2	2
47	Sales by DAs in their **4th month**	**23**				9	9	9	2	2	2	3	3	3	3	3	3	2	1	2	2	1	2	2	1	2
48	Sales by DAs in their **5th month**	**28**					9	9	9	2	2	2	3	3	3	3	3	3	2	1	2	2	1	2	2	1
49	Sales by DAs in their **6th month**	**32**						9	9	9	2	2	2	3	3	3	3	3	3	2	1	2	2	1	2	2
50	Sales by DAs in their **7th month**	**34**							9	9	9	2	2	2	3	3	3	3	3	3	2	1	2	2	1	2
51	Sales by DAs in their **8th month**	**36**								9	9	9	2	2	2	3	3	3	3	3	3	2	1	2	2	1
52	Sales by DAs in their **9th month**	**37**									9	9	9	2	2	2	3	3	3	3	3	3	2	1	2	2
53	Sales by DAs in their **10th month**	**37**										9	9	9	2	2	2	3	3	3	3	3	3	2	1	2
54	Sales by DAs in their **11th month**	**38**											9	9	9	2	2	2	3	3	3	3	3	3	2	1
55	Sales by DAs in their **12th month**	**38**												9	9	9	2	2	2	3	3	3	3	3	3	2
56	Sales by DAs in their **13th month**	**39**													9	9	9	2	2	2	3	3	3	3	3	3
57	Sales by DAs in their **14th month**	**39**														9	9	9	2	2	2	3	3	3	3	3
58	Sales by DAs in their **15th month**	**39**															9	9	9	2	2	2	3	3	3	3
59	Sales by DAs in their **16th month**	**39**																9	9	9	2	2	2	3	3	3
60	Sales by DAs in their **17th month**	**39**																	9	9	9	2	2	2	3	3
61	Sales by DAs in their **18th month**	**39**																		9	9	9	2	2	2	3
62	Sales by DAs in their **19th month**	**39**																			9	9	9	2	2	2
63	Sales by DAs in their **20th month**	**39**																				9	9	9	2	2
64	Sales by DAs in their **21st month**	**40**																					9	9	9	2
65	Sales by DAs in their **22nd month**	**40**																						9	9	9
66	Sales by DAs in their **23rd month**	**40**																							9	9
67	Sales by DAs in their **24th month**	**40**																								9
68	Sales by DAs in their **25th month**	**40**																								
69	Sales by DAs in their **26th month**	**40**																								
70	Sales by DAs in their **27th month**	**40**																								
71	Sales by DAs in their **28th month**	**40**																								
72	Sales by DAs in their **29th month**	**40**																								
73	Sales by DAs in their **30th month**	**40**																								
74	Sales by DAs in their **31st month**	**40**																								
75	Sales by DAs in their **32nd month**	**40**																								
76	Sales by DAs in their **33rd month**	**40**																								
77	Sales by DAs in their **34th month**	**40**																								
78	Sales by DAs in their **35th month**	**40**																								
79	Sales by DAs in their **36th month**	**40**																								
80	**Total**		10	20	29	31	33	35	37	39	42	45	48	51	53	54	56	58	59	61	63	64	66	68	69	71

Figure 33: Number of active demand activators at each level of sales (policy period)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
2			Number of Demand Activators Supported per calendar month																							
3	Average monthly toilets sales/ DA		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
4	Sales by DAs in their 1st month	2	10	10	10	3	3	3	3	3	3	3	3	3												
5	Sales by DAs in their 2nd month	8	-	10	10	10	3	3	3	3	3	3	3	3												
6	Sales by DAs in their 3rd month	16	-	-	9	9	9	2	2	2	3	3	3	3												
7	Sales by DAs in their 4th month	23	-	-	-	9	9	9	2	2	2	3	3	3												
8	Sales by DAs in their 5th month	28	-	-	-	-	9	9	9	2	2	2	3	3												
9	Sales by DAs in their 6th month	32	-	-	-	-	-	9	9	9	2	2	2	3												
10	Sales by DAs in their 7th month	34	-	-	-	-	-	-	9	9	9	2	2	2												
11	Sales by DAs in their 8th month	36	-	-	-	-	-	-	-	9	9	9	2	2												
12	Sales by DAs in their 9th month	37	-	-	-	-	-	-	-	-	9	9	9	2												
13	Sales by DAs in their 10th month	37	-	-	-	-	-	-	-	-	-	9	9	9												
14	Sales by DAs in their 11th month	38	-	-	-	-	-	-	-	-	-	-	9	9												
15	Sales by DAs in their 12th month	38	-	-	-	-	-	-	-	-	-	-	-	9												
16	Sales by DAs in their 13th month	39	-	-	-	-	-	-	-	-	-	-	-	-												
17	Sales by DAs in their 14th month	39	-	-	-	-	-	-	-	-	-	-	-	-												
18	Sales by DAs in their 15th month	39	-	-	-	-	-	-	-	-	-	-	-	-												
19	Sales by DAs in their 16th month	39	-	-	-	-	-	-	-	-	-	-	-	-												
20	Sales by DAs in their 17th month	39	-	-	-	-	-	-	-	-	-	-	-	-												
21	Sales by DAs in their 18th month	39	-	-	-	-	-	-	-	-	-	-	-	-												
22	Sales by DAs in their 19th month	39	-	-	-	-	-	-	-	-	-	-	-	-												
23	Sales by DAs in their 20th month	39	-	-	-	-	-	-	-	-	-	-	-	-												
24	Sales by DAs in their 21st month	40	-	-	-	-	-	-	-	-	-	-	-	-												
25	Sales by DAs in their 22nd month	40	-	-	-	-	-	-	-	-	-	-	-	-												
26	Sales by DAs in their 23rd month	40	-	-	-	-	-	-	-	-	-	-	-	-												
27	Sales by DAs in their 24th month	40	-	-	-	-	-	-	-	-	-	-	-	-												
28	Sales by DAs in their 25th month	40	-	-	-	-	-	-	-	-	-	-	-	-												
29	Sales by DAs in their 26th month	40	-	-	-	-	-	-	-	-	-	-	-	-												
30	Sales by DAs in their 27th month	40	-	-	-	-	-	-	-	-	-	-	-	-												
31	Sales by DAs in their 28th month	40	-	-	-	-	-	-	-	-	-	-	-	-												
32	Sales by DAs in their 29th month	40	-	-	-	-	-	-	-	-	-	-	-	-												
33	Sales by DAs in their 30th month	40	-	-	-	-	-	-	-	-	-	-	-	-												
34	Sales by DAs in their 31st month	40	-	-	-	-	-	-	-	-	-	-	-	-												
35	Sales by DAs in their 32nd month	40	-	-	-	-	-	-	-	-	-	-	-	-												
36	Sales by DAs in their 33rd month	40	-	-	-	-	-	-	-	-	-	-	-	-												
37	Sales by DAs in their 34th month	40	-	-	-	-	-	-	-	-	-	-	-	-												
38	Sales by DAs in their 35th month	40	-	-	-	-	-	-	-	-	-	-	-	-												
39	Sales by DAs in their 36th month	40	-	-	-	-	-	-	-	-	-	-	-	-												
40	Total		10	20	29	31	33	35	37	39	42	45	48	51	-	-	-	-	-	-	-	-	-	-	-	-

Figure 34: Total active demand activators (model period)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
2	Average monthly	# of Demand Activators per calendar month																							
3	toilets sales/ DA	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
4	0	27	27	27	9	9	9	9	9	10	9	10	22	31	43	35	25	17	16	17	17	18	18	18	28
5	1		27	27	27	9	9	9	9	9	23	35	36	26	13	25	26	25	18	17	18	17	15	26	26
6	2	38	38	51	26	26	16	17	16	30	29	31	20	16	35	35	48	34	34	25	45	44	58	42	45
7	3				13	13	13	26	61	61	47	24	24	23	24	23	22	34	35	30	15	28	29	29	20
8	4		28	28	28	23	36	48	40	30	22	21	22	44	40	40	26	24	33	45	57	48	39	31	30
9	5																			22	22	44	30	30	15
10	6																								
11	7															22	22	22	8	8	7	8	7	8	7
12	8		10	10	10	3	25	25	25	11	11	10	11	10	10	8	10	9	5	5	6	5	6	6	5
13	9									22	22	22	8	8	7	8	7	8	7	8	7	4	3	4	4
14	10												22	22	22	8	8	7	8	7	8	7	8	7	4
15	11			22	22	22	8	8	7	8	7	8	7	8	7	4	3	4	4	4	4	4	3	4	4
16	12																		22	22	22	8	30	29	30
17	13																								
18	14					22	22	22	8	8	7	8	7	8	7	8	29	26	25	12	12	11	12	11	33
19	15										22	44	44	30	16	15	15	15	15	15	15	15	11	7	7
20	16			9	31	31	24	10	10	10	11	10	11	10	11	9	5	27	28	27	14	14	12	35	35
21	17																								
22	18																								
23	19																								
24	20																								
25	21																								
26	22																								
27	23				9	9	9	2	2	2	3	3	3	3	3	3	2	1	2	2	1	2	2	1	2
28	24																								
29	25																								
30	26																								
31	27																								
32	28					9	9	9	2	2	2	3	3	3	3	3	3	2	1	2	2	1	2	2	1
33	29																								
34	30																								
35	31																								
36	32						9	9	9	2	2	2	3	3	3	3	3	3	2	1	2	2	1	2	2
37	33																								
38	34							9	9	9	2	2	2	3	3	3	3	3	3	2	1	2	2	1	2
39	35																								
40	36								9	9	9	2	2	2	3	3	3	3	3	3	2	1	2	2	1
41	37									9	18	18	11	4	4	5	6	6	6	6	6	5	3	3	4
42	38											9	18	18	11	4	4	5	6	6	6	6	6	5	3
43	39													9	18	27	29	31	33	36	39	33	27	21	22
44	40																					9	18	27	29
45	41																								
46	42																								
47	43																								
48	44																								
49	45																								
50	46																								
51	47																								
52	48																								
53	49																								
54	50																								
55	# DAs to be supported	65	130	174	175	176	189	203	216	232	246	262	276	281	283	291	299	306	314	322	328	336	344	351	359

Sheet name as per attached demand activation base model: "Total active DAs"

Figure 35: Total sales by all active demand activators (model period)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
2	Average monthly	# of toilets sold per calendar month																							
3	toilets sales/ DA	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
4	0																								
5	1		27	27	27	9	9	9	9	9	23	35	36	26	13	25	26	25	18	17	18	17	15	26	26
6	2	76	76	102	52	52	32	34	32	60	58	62	40	32	70	70	96	68	68	50	90	88	116	84	90
7	3				39	39	39	78	183	183	141	72	72	69	72	69	66	102	105	90	45	84	87	87	60
8	4		112	112	112	92	144	192	160	120	88	84	88	176	160	160	104	96	132	180	228	192	156	124	120
9	5																			110	110	220	150	150	75
10	6																								
11	7															154	154	154	56	56	49	56	49	56	49
12	8		80	80	80	24	200	200	200	88	88	80	88	80	80	64	80	72	40	40	48	40	48	48	40
13	9									198	198	198	72	72	63	72	63	72	63	72	63	36	27	36	36
14	10												220	220	220	80	80	70	80	70	80	70	80	70	40
15	11			242	242	242	88	88	77	88	77	88	77	88	77	44	33	44	44	44	44	44	33	44	44
16	12																		264	264	264	96	360	348	360
17	13																								
18	14					308	308	308	112	112	98	112	98	112	98	112	406	364	350	168	168	154	168	154	462
19	15										330	660	660	450	240	225	225	225	225	225	225	225	165	105	105
20	16			144	496	496	384	160	160	160	176	160	176	160	176	144	80	432	448	432	224	224	192	560	560
21	17																								
22	18																								
23	19																								
24	20																								
25	21																								
26	22																								
27	23				207	207	207	46	46	46	69	69	69	69	69	69	46	23	46	46	23	46	46	23	46
28	24																								
29	25																								
30	26																								
31	27																								
32	28					252	252	252	56	56	56	84	84	84	84	84	84	56	28	56	56	28	56	56	28
33	29																								
34	30																								
35	31																								
36	32						288	288	288	64	64	64	96	96	96	96	96	96	64	32	64	64	32	64	64
37	33																								
38	34							306	306	306	68	68	68	102	102	102	102	102	102	68	34	68	68	34	68
39	35																								
40	36								324	324	324	72	72	72	108	108	108	108	108	108	72	36	72	72	36
41	37									333	666	666	407	148	148	185	222	222	222	222	222	185	111	111	148
42	38											342	684	684	418	152	152	190	228	228	228	228	228	190	114
43	39													351	702	1053	1131	1209	1287	1404	1521	1287	1053	819	858
44	40																					360	720	1080	1160
45	41																								
46	42																								
47	43																								
48	44																								
49	45																								
50	46																								
51	47																								
52	48																								
53	49																								
54	50																								
55	Total monthly sales	76	295	707	1,255	1,721	1,951	1,961	1,953	2,147	2,524	2,916	3,107	3,091	2,996	3,068	3,354	3,730	3,978	3,982	3,876	3,848	4,032	4,341	4,589

Sheet name as per attached demand activation base model: "Total sales"

The next logical step, after calculation of the total number of demand activators across various performance levels in the duration of the policy period and the model period, is to calculate the total sales made by the demand activators. To determine the actual number of toilets sold every month by all active sales agents in that month, for each column in Figure 34, we multiply the number of active sales agent count in that month with the corresponding level of toilet sales in "Column A." For example, to know the total number of toilets sold in month 6, we would multiply, "G4" with "A4," "G5" by "A5," "G6" by "A6" and so on for the whole month. This calculation has been performed in the "Total sales" sheet (see Figure 35). If you see "Column G" in Figure 35, we can see that 1,961 toilets were sold in that month (cell "G55"). Further, we can see that of these 1,961 toilets, 32 toilets were sold by sales agents who sold 2 toilets each in that month (cell "G6"), 200 were sold by sales agents who sold 8 toilets each that month (cell "G12"), and 288 toilets were sold by sales agents who sold 32 toilets a month each (cell "G36"). This is important to know as commissions are paid out by the level of sale; therefore, the 32 toilets in "G6" would earn their sales agents USD 1.50 each (as the lowest commission slab is 0-4 toilets); the 200 toilets in "G12" would earn the sales agents USD 1.80 each (as the middle slab is 5-9 toilets); and the 288 toilets in "G36" would earn the sales agents USD 2.30 each (as the topmost slab is 10 toilets and above). These calculations happen automatically in the model. However, the user is advised to observe the output of the calculations to check their accuracy.

Users should note that the base model has been designed with a cap of a maximum of 50 toilets that can be sold by a demand activator in a month. To extend this limit, a user will have to perform the following steps: First, they will need to insert extra rows between Row 54 and Row 55 in the sheets 'Total active DAs' and 'Total Sales' (see Figure 34 and Figure 35). Second, they will need to drag the formulas of Row 54 to extend them to the rows they have just added. This will ensure that the calculation is extended to the additional number of toilets sold. Third, a user will have to ensure that the sum calculation happening in Row 55 (which will be dragged down to a lower row post insertion of additional rows) includes the added sum of the added rows. These three steps will allow a user to increase the maximum number of toilets that can be sold by a demand activator.

4.3.3 STAGE III: ADAPTING THE OUTPUT SHEETS

The output sheet provides the users with an assessment of both the benefits and the costs that could arise from enforcing the demand activation policy lever. The output of the base model has been split in two: increase in toilet sales and financial support given. Taken together, details of the increase in toilet sales and the costs can help stakeholders determine whether the policy lever should be enforced or not.

Step 8: Determining the increase in toilet sales & extent of financial support to be given

The output sheet, namely "Financial support given to DAs," is a culmination of the inputs entered by the user and the calculations performed by the model. The sheet (see Figure 36) is broken into five broad blocks of figures:

i. Green block (in Figure 36) is a sum of all the demand activators who are active in each calendar month during the policy period (in the base model, we have assumed the duration of the policy period to be 12 months). In each month, the total number of active demand activators is disaggregated by the number of demand activators whose sales fall into the three commission slabs. As previously mentioned, a user can modify the commission slabs by altering the minimum sales ranges for the slabs in "Row 66" to "Row 68" of sheet "General Inputs." The numbers in the Green block (in Figure 36) are imported from the "DAs active in the policy period" sheet (see Figure 37)

ii. Yellow box (in Figure 36) is a sum of the total number of toilets sold within each commission slab every month. This is calculated by adding the number of toilets sold in each column of the sheet shown in (Figure 38). The formula used in the base model uses the sales ranges for the commission slabs to distribute sales across the three commission bands. As previously mentioned, a user can modify the commission slabs by altering the minimum sales ranges for the slabs in "Row 66" to "Row 68" of sheet "General Inputs."

iii. Purple box (in Figure 36) is composed of the third and fourth blocks. The first part of this block estimates the cumulative income expected by all active demand activators each calendar month. This is determined by multiplying the cells in the green box in Figure 36 by the minimum income expected from toilet sales (as set by the user in "Row 5" to "Row 7" of the "Dashboard" sheet). This provides the user with a sense of the total amount those sales agents expect to earn a month. From this we subtract the actual monthly income earned by these sales agents through commissions (this is the second part of the table in the purple box). The commission amount earned is calculated by multiplying the total toilet sales in the yellow box, with the commission for the slab in which those toilets were sold. For example, in month 6, sales agents selling in slab 1 expect an income of USD 1,518 ("G19"), but the income they actually earn through commissions in month 6 is USD 96 ("G23").

iv. Blue box (in Figure 36) calculates the actual amount of support to be given to sales agents. This is done by subtracting the income from commissions in each month from the minimum income expected by the sales agents in a month. For example, in month 6, the support given to sales agents with poor sales is equal to USD 1,422 (cell "G27"), which is the difference between the USD 1,518 expected by sales agents in month 6 (cell "G19") and the commissions paid to sales agents that month, i.e., USD 96.

v. Red box (in Figure 36) aggregates key outputs of the model and displays them at a yearly level. The outputs summarized in this fashion include

- Yearly support given (USD) – "Row 31"
- Total number of toilets built (#) - includes those no longer supported – "Row 32"
- Number of toilets built directly as a result of the policy lever (#) – "Row 33"
- Number of toilets built indirectly as a result of the policy lever (#) – "Row 34"
- Cost per toilet - direct toilets only (USD) – "Row 35"
- Cost per toilet - including direct and indirect toilets (USD) - "Row 36

In case the user changes the duration of the policy period in the sheet "Dashboard," the "Financial support given to DAs" sheet automatically reduces or increases, i.e., the number of columns that display the calculations are dynamic and reveal or hide themselves depending on the number of months for which the user runs the policy.

Figure 36: Increase in toilet sales and financial support to be given to demand activators

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	**Output: Financial support given to demand activators**																				
2		Calendar month																			
3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
4	Number DAs supported by the policy lever (# DAs/ month)																				
5	# DAs whose monthly sales fall in Slab 1	65	120	133	41	23	22	44	66	66	52	38	37								
6	# DAs whose monthly sales fall in Slab 2		10	10	10	3	25	25	25	33	33	32	19								
7	# DAs whose monthly sales fall in Slab 3			31	62	93	72	51	29	30	52	76	97								
8	Total # DAs supported	65	130	174	113	119	119	120	120	129	137	146	153								
11	Total monthly sales by supported DAs (# of toilets/ month)																				
12	Total number of toilets sold by DAs in Slab 1	76	215	241	138	66	64	128	196	194	154	110	109								
13	Total number of toilets sold by DAs in Slab 2		80	80	80	24	200	200	200	286	286	278	160								
14	Total number of toilets sold by DAs in Slab 3			386	945	1,505	1,239	854	451	462	806	1,173	1,384								
15	Total sales by supported Das	76	295	707	1,163	1,595	1,503	1,182	847	942	1,246	1,561	1,653								
18	Total income expectation of spported DAs (USD/ month)																				
19	Income expected by DAs whose sales fall in Slab 1	4,485	8,280	9,177	2,829	1,587	1,518	3,036	4,554	4,554	3,588	2,622	2,553								
20	Income expected by DAs whose sales fall in Slab 2		690	690	690	207	1,725	1,725	1,725	2,277	2,277	2,208	1,311								
21	Income expected by DAs whose sales fall in Slab 3			2,139	4,278	6,417	4,968	3,519	2,001	2,070	3,588	5,244	6,693								
22	Commissions earned by supported DAs (USD/ month)																				
23	Commission earned by DAs selling in Slab 1	114	323	362	207	99	96	192	294	291	231	165	164								
24	Commission earned by DAs selling in Slab 2		144	144	144	43	360	360	360	515	515	500	288								
25	Commission earned by DAs selling in Slab 3			888	2,174	3,462	2,850	1,964	1,037	1,063	1,854	2,698	3,183								
26	"Top up" support given to DAs by the government (USD/ month)																				
27	Support given to DAs selling in Slab 1	4,371	7,958	8,816	2,622	1,488	1,422	2,844	4,260	4,263	3,357	2,457	2,390								
28	Support given to DAs selling in Slab 2		546	546	546	164	1,365	1,365	1,365	1,762	1,762	1,708	1,023								
29	Support given to DAs selling in Slab 3			1,251	2,105	2,956	2,118	1,555	964	1,007	1,734	2,546	3,510								
30	Total support given by the government (USD/ month)	4,371	8,504	10,613	5,273	4,607	4,905	5,764	6,589	7,033	6,853	6,711	6,922								
31	Yearly support given (USD)												78,144								
32	Total number of toilets built (#) - includes those no longer supported												20,613								
33	Number of toilets built directly as a result of the policy lever (#)												12,770								
34	Number of toilets built indirectly as a result of the policy lever (#)												7,843								
35	Cost per toilet - direct toilets only (USD)												6.1								
36	Cost per toilet - including direct and indirect toilets (USD)												3.8								

Sheet name as per attached demand activation base model: "Financial support given to DAs"

Figure 37: Total active DAs (policy period)

	A	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
2	Average monthly	# of Demand Activators per calendar month																					
3	toilets sales/ DA	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
4	0	27																					
5	1	27																					
6	2	51	13	13	12	13	12	13	12	13	12												
7	3					22	44	44	30	16	15												
8	4	28	28	10	10	9	10	9	10	9	10												
9	5																						
10	6																						
11	7																						
12	8	10	10	3	25	25	25	11	11	10	11												
13	9							22	22	22	8												
14	10										22												
15	11	22	22	22	8	8	7	8	7	8	7												
16	12																						
17	13																						
18	14			22	22	22	8	8	7	8	7												
19	15								22	44	44												
20	16	9	31	31	24	10	10	10	11	10	11												
21	17																						
22	18																						
23	19																						
24	20																						
25	21																						
26	22																						
27	23		9	9	9	2	2	2	3	3	3												
28	24																						
29	25																						
30	26																						
31	27																						
32	28			9	9	9	2	2	2	3	3												
33	29																						
34	30																						
35	31																						
36	32				9	9	9	2	2	2	3												
37	33																						
38	34					9	9	9	2	2	2												
39	35																						
40	36						9	9	9	2	2												
41	37							9	18	18	11												
42	38									9	18												
43	39																						
44	40																						
45	41																						
46	42																						
47	43																						
48	44																						
49	45																						
50	46																						
51	47																						
52	48																						
53	49																						
54	50																						
55	# Active DAs	174	113	119	128	138	147	158	168	179	189	0	0	0	0	0	0	0	0	0	0	0	0

Sheet name as per attached demand activation base model: "DAs active in policy period"

Figure 38: Total sales by all active demand activators (policy period)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
2	Average monthly	# of toilets sold per calendar month																							
3	toilets sales/ DA	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
4	0																								
5	1		27	27																					
6	2	76	76	102	26	26	24	26	24	26	24	26	24												
7	3							66	132	132	90	48	45												
8	4		112	112	112	40	40	36	40	36	40	36	40												
9	5																								
10	6																								
11	7																								
12	8		80	80	80	24	200	200	200	88	88	80	88												
13	9									198	198	198	72												
14	10												220												
15	11			242	242	242	88	88	77	88	77	88	77												
16	12																								
17	13																								
18	14					308	308	308	112	112	98	112	98												
19	15										330	660	660												
20	16			144	496	496	384	160	160	160	176	160	176												
21	17																								
22	18																								
23	19																								
24	20																								
25	21																								
26	22																								
27	23				207	207	207	46	46	46	69	69	69												
28	24																								
29	25																								
30	26																								
31	27																								
32	28					252	252	252	56	56	56	84	84												
33	29																								
34	30																								
35	31																								
36	32						288	288	288	64	64	64	96												
37	33																								
38	34							306	306	306	68	68	68												
39	35																								
40	36								324	324	324	72	72												
41	37									333	666	666	407												
42	38											342	684												
43	39																								
44	40																								
45	41																								
46	42																								
47	43																								
48	44																								
49	45																								
50	46																								
51	47																								
52	48																								
53	49																								
54	50																								
55	Total monthly sales	76	295	707	1,163	1,595	1,791	1,776	1,765	1,969	2,368	2,773	2,980	-	-	-	-	-	-	-	-	-	-	-	-

Sheet name as per attached demand activation base model: "Monthly sales in the policy period"

4.3.4 STAGE IV: UPDATING THE USER DASHBOARD

In the base model, a user dashboard was created to collate all the key variables that directly influence the outputs of the model. To understand the impact these variables played on the results of the policy lever, an impact table was also created.

Step 9: Modifying the control panel

The control panel was constructed to allow users to easily update the value of the key variables in order to see the impact this has on the outputs. Changing the value of these key variables will update the outputs in real-time. Figure 39 shows the "Control panel" in the "Dashboard" sheet that can be found in the accompanying base model. The key variables that the control panel allows the user to modify are:

- The total income potential demand activators expect from all income-generating activities
- The percentage of time spent by demand activators on selling toilets
- The total income from selling toilets expected by potential demand activators
- The commission amount to be paid to the demand activators
- The percentage of the target market to be covered under the policy
- The number of households/ settlements in the sales territory of one demand activator
- The percentage of demand activators expected to have stable, average, and poor sales
- The duration (in months) for which the government provides "top-up" support

In case the user modifies the base model to build further granularity, we encourage the user to add the source inputs for the granularity in the control panel. This would ensure that all key variables of the model are located together.

Figure 39: Control panel in the "Dashboard" sheet of the base model

	A	B	C	D	E	F
3	**Control Panel**					
4		Minimum income guarantee		Year 1	Year 2	Year 3
5	Details of government support	Total expected income/ month (USD)		230	230	230
6		Percentage of time spent by demand activators on selling toilets (%)		30%	30%	30%
7		Minimum income guaranteed from selling toilets (USD)		69	69	69
8		Commission Slabs		Year 1	Year 2	Year 3
9		Commission for DAs who sell in the bottom slab - Slab 1 (USD)		1.50	1.50	1.50
10		Commission for DAs who sell in the middle slab - Slab 2 (USD)		1.80	1.80	1.80
11		Commission for DAs who sell in the top slab - Slab 3 (USD)		2.30	2.30	2.30
12		Capacity of demand activators		Year 1	Year 2	Year 3
13		Percentage of villages (rural) in target market that the policy will cover		50%	50%	50%
14		Percentage of towns (urban) in the target market that the policy will cover		10%	10%	10%
15		Number of households covered by one demand activator		7,000	5,000	3,500
16		Constraints		Stable DAs	Average DAs	Poor DAs
17		Percentage of demand activators by level of sales		20%	50%	30%
18		Attrition rate of demand activators		5%	20%	50%
19		Number of Months for which the government supports DAs (#)		12	12	3

Sheet name as per attached demand activation base model: "Dashboard"

Step 10: Modifying the "impact of the policy" table

The blue "impact of the policy" table shown in Figure 40 is where the outputs are updated depending on the values set in the control panel. In order to effectively support analysis and decision making, the dashboard provides only the most relevant information in a way that is easy to read and understand. Therefore, this sheet focuses only on: the number of toilets sold by sales agents – both directly during the policy period, and indirectly over the entire model period; the change in sanitation coverage; and the cost to the government in terms of total cost as well as the per toilet cost.

Figure 40: Impact of the policy table in the "Dashboard" sheet of the base model

	A	B	C	D	E	F
20						
21	**Impact of the policy**					
22			Total	Year 1	Year 2	Year 3
23	Change in sanitation coverage	Total toilet sales (#)	1,31,657	20,613	44,885	66,159
24		Toilets sales directly as a result of the policy lever (#)	12,770	12,770	-	-
25		Existing sanitation coverage (at least basic) (%)		29.4%	29.8%	30.7%
26		New sanitation coverage - including direct and indirect toilets (%)		29.8%	30.7%	32.1%
27		**Increase in sanitation coverage - including direct and indirect toilets (%)**	**2.8%**	**0.4%**	**0.9%**	**1.4%**
28						
29	Cost-benefit to the government	Total cost to government across demand activators (USD)	78,144	78,144	-	-
30		**Cost per toilet - direct toilet sales only (USD)**	**6.1**	**6.1**	-	-
31		**Cost per toilet - including direct and indirect toilets (USD)**	**0.6**	**3.8**	-	-

Sheet name as per attached demand activation base model: "Dashboard"

In case the user modifies the base model to build further granularity, the user is encouraged to add any new output variables in the "Impact of the policy" table. This would ensure that all key output variables of the model are located together.

5.0 CHECKING FOR ERRORS

The previous chapter discussed how the base model could be modified for use in different geographies/ markets. While in some instances adapting the model may be fairly straightforward, in other cases it may require changes to the structure of the model and the formulae used. In the latter instance, there are chances that the changes made may not reflect throughout the model, or that the formulae in some sheets are not updated accurately. Even if the changes made don't actually require changes to the structure and formulae, it is possible for errors to be made in the way the data is entered in the input sheets and how these sheets are linked to each other. If either case occurs, the model would generate faulty outputs, and or there may be errors that prevent it from generating any outputs at all. Some of the common pitfalls that occur when adapting an existing model are mentioned in Box 1.

There are a series of checks the user should run in order to ensure the model is error-free. The main checks that should be carried out are described below:

i. **Hygiene checks:** These are basic quality checks that should be done sheet-wise as the user finishes updating a sheet, and at again at the end once all updates have been made. The hygiene checks include:

   a. Going through each sheet and making sure none of the cells contain error messages such as "#REF!"; if such an error does exist, it means that there is an incorrectly linked formula, and/ or one of the cells the formula refers to has been renamed or deleted

   b. Ensuring hardcoded data has been entered and cleaned correctly and there are no errors such as the wrong unit being used for a number (extra zeroes, or too few zeroes), misplaced decimal points, incorrect formatting of cells (e.g., format type set to number instead of percentage when entering percentages)

   c. Ensuring that links in and links out from a sheet are connected to the correct cells. For example, ensuring that links out to the urban enforcement schedule are from the urban sanitation coverage inputs sheet and not the rural sanitation coverage sheet

   d. Ensuring that only the data that is to be displayed is being displayed in cases where conditional ("IF") functions have been used. For example, if the policy has not been applied to any rural houses, there should be no data in the rural column of the user dashboard, the rural column of the enforcement costs sheet, and the rural enforcement schedules. If there is data in these cells, it means that there is an error in the formula used. Similarly, if the policy is not applied to a particular housing segment, the columns for those segments in the enforcement schedule should be blank. This last case is something that should especially be checked for in cases where the user adds more than four segments to the model

ii. **Stress tests:** Stress tests involve deliberately introducing extreme values into the model and doing a sense check to see if the resultant outputs are valid. This involves using values that are either known to be unrealistic, or are outside a defined range set by the model and seeing if the logical relationships still hold. For example, if default rates are set at 100% after both the forewarn stage and the improvement notice stage, and there is still a net increase/ decrease in sanitation coverage, it indicates that one of the formulae governing the logical relationship has broken down. Similarly, if very high and very low values are set for the key variables but there is no discernable change in the net sanitation coverage, it implies that either a formula is not correctly applied, or the key variable selected is inappropriate. It is recommended that this test

be done for all key variables, but one at a time; i.e., at any time one of the key variables should be varied while holding the values of the others constant

iii. **Testing for overweight variables:** This is a subset of the stress test. While testing the key variables individually, the user should also see whether any of the variables has a disproportionate effect on the outputs. If this is the case, it could be due to incorrect hardcoded data, or an assumption that gives undue/ insufficient importance to one of the key variables.

iv. **Scenario tests:** This test flips the model on its head. Starting with a desired output, the user tests to see the combination of key variables that are required to achieve this pre-defined output. For example, if a minimum 10% increase in sanitation coverage is desired within 24 months, what combination of values for the key variables would achieve this? The user then needs to do a sense check to ascertain whether this combination of variables is realistic or not. Note, for this test to work, the user should have a general idea of what is realistically achievable in a given context

v. **Field tests:** The final test is an external test, as opposed to the earlier four tests which are all internal to the model. Field testing means validating the model (and its predicted outputs) with experts who have in-depth experience in the sanitation sector in the selected geography/ market. Reactions from these experts can help refine assumptions and correct any logical flaws there may be in the model

Box 1: Common pitfalls in adapting an existing model

Common Pitfalls

Some of the common mistakes made while updating an existing model include:

- **Incomplete adaptation:** The different sheets in the base model contain multiple linkages to each other and changes to any one will require changes in all linked sheets. For example, if the user changes the number of housing segments in the input sheets, he/ she would need to make similar changes in the calculation, output, and dashboard sheets
- **Overwriting formulae:** To enable the interlinkage of sheets, a number of cells have formulae that import data from source cells. When updating these linked cells, changes need to be made in the source cells. If data is hardcoded into a linked cell, it may lead to erroneous outputs
- **Linking wrong cells:** When working with multiple housing segments, toilet types and geographic units, it is possible that errors can be made in linking data.
- **Deleting linked cells:** Another challenge of working with linked cells is that if the user deletes any such cell, all linked cells would be affected and it may be difficult to trace back the error
- **Working with named cells:** Some of the cells in the input and calculation sheets have been named and the formulae that link to these cells utilize the name of these cells. This may result in some challenges when updating the model. For example, if the name of any of these cells is changed, the formulae that link to these cells will break. Similarly, dragging formulae that contain names of cells would copy the exact value in the original cells rather than replicate the formulae

6.0 USING THE MODEL AS A DECISION MAKING TOOL

Once the user has finished adapting the model and checking for errors, the model can be used to generate outputs which can facilitate decision making on sanitation policymaking. The model outputs can aid decision making through 3 key benefits:

- Users can use the model to aid **prioritization** of different target markets and policies. They can compare the impact of applying the policy to different target markets under their purview. They can also compare the impact of applying the policy in their target market, to the impact of applying other policies (for which similar models may exist).
- Users can gather inputs to **plan implementation** from a financial and operational perspective, which can be used for advocacy and budgeting purposes. This model can generate estimates of the total cost of paying demand activator commissions for the duration of the policy, as well as how this cost is spread over time.
- Finally, users can use the model to **strengthen the confidence of decision-makers** on the policy by identifying the critical factors that drive the outputs of this model, which may warrant further investigation. For example, the sales curve of demand activators is a critical factor that drives the outputs of the model. Users can choose to conduct further research on understanding this factor to get more robust estimates. This develops greater confidence in the potential efficacy of the policy and enables buy-in from different stakeholders.

7.0 LIMITATIONS OF THE MODEL

The model described in this guide can be a powerful tool for policymakers to support their decision making on sanitation-related market rules. However, the model has limitations since it is based on an economic modeling approach; more specifically, this model is limited by its reliance on publically available data and select expert interviews.

Economic modeling has certain inherent limitations as an analytical tool and these are reflected in this model:

- **Economic models are an abstraction of reality, and cannot include all the logical relationships** that influence the model outputs since the precise mathematical equation for such relationships may not be known. Below, we highlight the most pertinent missing logical relationships for this model:
    - **Relationship between attrition rate, toilets built and administrative costs:** The base model assumes that, regardless of the attrition rate, the implementers will be able to recruit the necessary number of demand activators. Hence, the total toilets built do not vary significantly with the attrition rate. However, in reality, this assumption may not hold true as implementers could struggle to hire demand activators in case of a very high attrition rate. A very high attrition rate is also likely to increase administrative costs, such as the marketing costs to hire additional demand activators. These relationships have not been considered in the model as the mathematical relationships between these variables could not be ascertained.
    - **Relationship between households covered by each demand activator and toilets built:** In the base model, if the number of households covered by each demand activator increases, then the total toilets built decreases. This is counter-intuitive as higher productivity of demand activators should lead to sales of more toilets. However, the base model determines the number of demand activators by the number of households covered by each demand activator, keeping the geographic area they cover as constant. As such, the higher productivity of the demand activators will not translate to them covering more geographic area and the reduced number of demand activators will lead to fewer total toilets built.
    - **Relationship between commission amounts and toilets built:** In the base model, the commission paid to demand activators does not impact how many toilets they sell. However, in reality, this assumption may not hold true as a higher commission amount is likely to incentivize demand activators to sell more. This relationship has not been considered in the model as the mathematical relationship between these variables could not be ascertained.
    - **Relationship between time spent on sanitation and sales productivity:** In the base model, the time spent by demand activators on sanitation does not impact how many toilets they sell. However, in reality, this assumption may not hold true as a greater time spent on sanitation is likely to increase the sales productivity of demand activators. This relationship has not been considered in the model as the mathematical relationship between these variables could not be ascertained.

- **Economic models hold certain systemic or macroeconomic factors constant over time** as they are hard to predict or model. However, if contextual factors do change, the data in the model may need to be updated to reflect this. Below, we highlight the most pertinent contextual factors which are assumed to be constant in the base model:

    - **Supply of toilets:** The base model assumes that the supply of toilets in Bihar will not change in the short-run and will be sufficient to fulfill the demand created by demand activators. A dramatic reduction in supply of toilets may lead to the inability of demand activators to sell toilets.
    - **Political and economic environment:** If there is an economic crisis in the country, the ability of households to afford toilets may be drastically affected (thus reducing demand for toilets in the market), and/ or the ability of entrepreneurs to access capital to run their businesses may be severely limited (thus reducing the supply of toilets in the market).

In all of the above cases, stakeholders need to exercise their judgement when entering values for variables to ensure they are as close to a reflection of reality. At the same time, they need to complement the outputs produced by the model with their understanding of the ground-level realities of the markets they hope to influence. Doing this ensures that the model produces more robust outputs that are useful for guiding decision making in most 'normal' conditions.

This model is further limited due to the fact that it was built using publically available data and select interviews with experts. Economic models require a minimum base-level of data and the estimates generated are only as good as the quality of underlying data. As such, the data used to construct the model lacks granularity, which can manifest as an issue in multiple ways:

- **The quality of outputs can significantly reduce due to errors in estimating the most sensitive variables** as data for many such variables is not available publically at a sufficiently granular level. Any errors in such variables get amplified as the model outputs are highly sensitive to them. Below, we highlight the variables to which the current model is the most sensitive:

    - No. of households covered by a demand activator
    - Percentage breakdown of demand activators by type (Stable, Average and Poor)
    - The expected sales of different types of demand activators

    Users of the model should sufficiently validate the accuracy of the above variables.

- **The model does not incorporate all the intricacies of a typical policy process** since it is based on sample market rules. The different processes of the market rule were modeled based on publically available data and select expert interviews. These processes encapsulate the major stages of the policy and do not detail the sub-stages or intermediate minor stages, which are unavailable in the public domain and not captured in the models. For example, the model does not consider the administrative processes and costs involved in disbursing the commissions to demand activators, only the monetary cost of the commissions.

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ANNEX 2: REFERENCES

The demand activation base model was constructed using secondary data on Bihar. The key references used in the base model are listed below:

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