

Life-Cycle Costs Approach

Glossary and cost components

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Abbreviations, acronyms, and terms

CapEx	Capital Expenditure
CapManEx	Capital Maintenance Expenditure
CoC	Cost of Capital
DST	Decision-Support Tools
ExpDS	Expenditure on Direct Support
ExpIDS	Expenditure on Indirect Support
LCC	Life-Cycle Costs
LCCA	Life-Cycle Costs Approach
MIS	Management Information Systems
OpEx	Operating and Minor Maintenance Expenditure
WASH	Water, sanitation, and hygiene

Life-cycle costs approach

Life-cycle costs refer to the costs of ensuring adequate water, sanitation, and hygiene (WASH) services to a specific population in a determined geographical area, not just for a few years, but indefinitely. They include not only the costs of constructing new systems but also what it costs to maintain them in the short and long term and at higher institutional levels. Costs for both district and national level administration and planning are taken into account, as well as the costs of replacing and extending infrastructure. This briefing note describes the costs definitions used in WASHCost.

Defining life-cycle costs (LCC) and life-cycle costs approach (LCCA)

Life-cycle costs (LCC) represent the aggregate costs of ensuring delivery of adequate, equitable and sustainable WASH services to a population in a specified area. These costs include the construction and maintenance of systems in the short and longer term, taking into account the need for hardware and software, operation and maintenance, capital maintenance, the cost of capital, source protection, and the need for direct and indirect support, including training, planning and institutional pro-poor support. The delivery of sustainable services also requires that financial systems are in place to ensure that infrastructure can be replaced at the end of its useful life and to extend delivery systems in response to increases in demand. This is the 'life-cycle' at the heart of this approach - what is needed to sustain, repair and replace a water (or sanitation) system through the whole of its cycle of wear, repair and renewal.

Collecting and understanding these costs is a primary aim of the WASHCost project. However, the life-cycle costs approach (LCCA) goes beyond achieving the technical ability to quantify and make costs readily available. It seeks to influence sector understanding of why life-cycle costs assessment is central to improved and sustained service delivery and to influence the behaviour of sector stakeholders, so that life-cycle unit costs are mainstreamed into WASH governance processes at all institutional levels from local to national to international. WASHCost aims to increase the ability and willingness of decision makers (both users and those involved in service planning, budgeting and delivery) to make informed and relevant choices between different types and levels of WASH service.

A significant element of the LCCA is an understanding that costs can only be compared and properly assessed when they are related to particular levels of service. WASHCost specifically aims to draw attention to the LCC of pro-poor WASH services delivery, including water for small-scale productive uses.

WASHCost aims to help national and decentralised sector bodies to embed an understanding and use of life-cycle costs so that this approach becomes institutionalised, owned and actively used within countries and internationally, and that national bodies develop and maintain their own LCC databases and incorporate them into management information systems (MIS) and decision-support tools (DST).

Short definitions

Life-cycle costs (LCC) represent the aggregate costs of ensuring delivery of adequate, equitable and sustainable WASH services to a population in a specified area.

The life-cycle costs approach (LCCA) seeks to raise awareness of the importance of life-cycle costs in achieving adequate, equitable and sustainable WASH services, to make reliable cost information readily available and to mainstream the use of LCC in WASH governance processes at every level.

Cost components

The main components of life-cycle costs being proposed by WASHCost are the following:

Capital expenditure – hardware and software (CapEx)

The capital invested in constructing fixed assets such as concrete structures, pumps and pipes. Investments in fixed assets are occasional and 'lumpy' and include the costs of initial construction and system extension, enhancement and augmentation.

CapEx software includes one-off work with stakeholders prior to construction or implementation, extension, enhancement and augmentation, (such as costs of one-off capacity building).

Capital maintenance expenditure (CapManEx)

Expenditure on asset renewal, replacement and rehabilitation costs, based upon serviceability and risk criteria. CapManEx covers the work that goes beyond routine maintenance to repair and replace equipment, in order to keep systems running. Accounting rules may guide or govern what is included under capital maintenance and the extent to which broad equivalence is achieved between charges for depreciation and expenditure on capital maintenance. Capital maintenance expenditures and potential revenue streams to pay those costs are critical to avoid the failures represented by haphazard system rehabilitation.

Cost of capital (CoC)

The cost of capital is the cost of financing a programme or project, taking into account loan repayments and the cost of tying up capital. In the case of private sector investment the cost of capital will include an element distributed as dividends.

Operating and minor maintenance expenditure (OpEx)

Expenditure on labour, fuel, chemicals, materials, regular purchases of any bulk water. Most cost estimates assume OpEx runs at between 5% and 20% of capital investments. Minor maintenance is routine maintenance needed to keep systems running at peak performance, but does not include major repairs.

Expenditure on direct support (ExpDS)

Includes expenditure on post-construction support activities direct to local-level stakeholders, users or user groups. In utility management, expenditure on direct support such as overheads is usually included in OpEx. However, these costs are rarely included in rural water and sanitation estimates. The costs of ensuring that local government staff have the capacities and resources to help communities when systems break down or to monitor private sector performance are usually overlooked.

Expenditure on indirect support (ExpIDS)

This includes macro-level support, planning and policy making that contributes to the service environment but is not particular to any programme or project. Indirect support costs include government macro-level planning and policy-making, developing and maintaining frameworks and institutional arrangements, and capacity-building for professionals and technicians.

The detailed elements for each of the cost components are listed in the annexes.

Sources

Franceys, R. ; Perry, C. ; Fonseca, C. (2006). *Guidelines for user fees and cost recovery for water, sanitation and irrigation projects*. IRC/Cranfield report for the African Development Bank. Unpublished.

Fonseca, C. (2007). *Quantifying the costs of delivering safe water, sanitation and hygiene services: an overview of cost ranges and trends*. IRC report for the Bill and Melinda Gates Foundation. Unpublished.

Annexes

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Table 1: Checklist Life-cycle cost components – Water

Life-cycle cost components	Resources	Infrastructure	Demand/Access
<p>Water</p>	<p>Costs involved in sustainable provision of water resources of required quantity and quality</p>	<p>Costs incurred by service providers when constructing, operating and maintaining water supply infrastructure</p>	<p>Costs incurred by users who routinely access formal, informal and private water supply systems to meet demands (domestic, municipal, commercial, industrial, MUS, live-stock etc). These costs include any costs that are not met by the service providers.</p>
<p>CapEx Hardware <i>Capital investment in fixed assets: first time, extension, enhancement and augmentation</i></p>	<ul style="list-style-type: none"> - Costs of WASH-related land treatment: Source protection measures involving: extensive land treatment, construction of small recharge structures, bending and terracing to prevent soil erosion and sedimentation, water conservation measures within urban areas etc - Costs of WASH-related engineering structures: flood control structures, large groundwater recharge structures etc - Costs of unconventional water sources: desalination plants, wastewater treatment, inter-basin transfers - For triangulation purposes: government subsidies 	<ul style="list-style-type: none"> - Costs of constructing water storage infrastructure: reservoirs, tanks etc - Costs of water supply infrastructure: wells (public and private), canals, pumps, reticulation systems, balancing reservoirs, water tankers (public and private), water trains, offices, warehouses, etc - Costs incurred when dry or low-yielding bore wells are drilled - Costs of water treatment plants: desalination, fluoride, polluted water etc - Costs of “overdesign” relating to demands of floating populations, climate change mitigation - Additional pro-poor costs: related to pro-poor setting of water points and/or provision of MUS water - Costs of small-scale water supply infrastructure: community roof-water harvesting systems, community storage tanks, community connections etc. - Costs of installing water meters: point-of-supply meters, telemetry systems, vehicles, IT systems for processing info - Costs of water quality monitoring: test kits, laboratories, vehicles, buildings, sampling equipment etc - Cost of putting in place of billing system: vehicles, IT costs etc - For triangulation purposes: government subsidies to construction 	<ul style="list-style-type: none"> - Community contribution to initial infrastructure costs e.g. percentage charged by service provider - Costs of water supply infrastructure purchased by users e.g. water storage tanks or cisterns, filtration systems, piping, roof water harvesting systems - Costs of private borewells. If needed by users to augment the supply from the water provider - One-off connection charges: e.g. charge for connecting supply to individual houses

Life-cycle cost components	Resources	Infrastructure	Demand/Access
<p>CapEx Software <i>One-off work with stakeholders prior to construction or implementation, extension, enhancement and augmentation</i></p>	<ul style="list-style-type: none"> - Cost of resource assessments: resource assessments and audits (quality and safe yield) to identify source(s), specialist analysis, use of GIS and remotely sensed data, ground truth of secondary information - Design costs: source protection measures, facilitation of stakeholder participation - Regulation costs: establishment of groundwater protection zones, sanctuaries and/or strategic reserves - Costs of Information, Education and Communication, institutional development and capacity building - Cost of compensation for people moved for dams or protection zones 	<ul style="list-style-type: none"> - Infrastructure assessment costs: Assessment of the status of existing infrastructure - Demand assessments costs: assessment of current and future seasonal demands for all uses and users that access WASH infrastructure - Engineering design costs: Costs of preparing GIS based maps to support and underpin design and planning processes, technical surveys, etc - Costs of active stakeholder participation: facilitated multi-level planning - Costs of using specialist knowledge: scenario building as an integral part of planning process, modeling and forecasting supply and demand - Costs of IEC, institutional development and capacity building - Costs for demand creation for improved services: construction of “show case” sites, exchange visits - Cost of purchasing land on which to locate WASH infrastructure: e.g. private operator buying land 	<ul style="list-style-type: none"> - Costs of active stakeholder participation: e.g building and supporting community level organisations that participate in stakeholder-driven planning processes , facilitating planning processes etc - Costs of using specialist knowledge: by users to design infrastructure that they fund - Costs of IEC, institutional development and capacity building: skills needed as part of developing and sustaining community-level organisations, in users O&M activities etc
<p>Costs of Capital</p>	<ul style="list-style-type: none"> - Cost of interest payments: e.g., World Bank loans 	<ul style="list-style-type: none"> - Cost of interest payments: World Bank loans, personal loans (e.g. for small-scale private service providers) 	<ul style="list-style-type: none"> - Cost of interest payments: Personal loans (e.g. household connections), microfinance (either personal or group/ community based)

Life-cycle cost components	Resources	Infrastructure	Demand/Access
<p>OpEx <i>Operating and minor maintenance expenditures</i></p>	<ul style="list-style-type: none"> - Cost of maintaining structures listed in CapEx - Costs of enforcing regulations relating to pollution and groundwater protection zones, transport, ground-water level recorders etc - Possible payments to land users under “payment for environmental services” schemes aimed at maintaining water quality of surface or groundwater resources - Cost for raw water abstraction (e.g. operator paying regulatory authority for abstracting water) - For triangulation purposes: government subsidies 	<ul style="list-style-type: none"> - Cost of operating and maintaining infrastructure listed in CapEx - Costs of O&M: electricity or fuel, water man/water women costs, repairs, spare parts - Costs of emergency or back-up supplies: Payments to vendors or farmers for “emergency” water supply - Costs of monitoring - Rent of land (e.g. private operator paying for land use) - Cost for using of system (e.g. operator paying district or municipality for use of infrastructure) - Costs of billing scheme: meter reading, meter repair, billing system, debt collection - Cost of complaints/breakdown system: ensuring that demands are met 365 days/year, ensuring norms are achieved, breakdown notification and response system - Costs of enforcing regulations: checking meters, checking for illegal connections or water uses, pollution monitoring - Costs of leak detection: reducing unaccounted for water (UAW) - For triangulation purposes: government subsidies 	<ul style="list-style-type: none"> - Cost of transport (payment for cart, buckets, etc) - The cost incurred to complement the service: cost of filtration/treatment (i.e. consumables, chloride, buckets, fuel for boiling water) - The cost incurred to supplement the service: contribution to OpEx, costs of alternative sources - For triangulation purposes: profit margin of the operator
<p>CapManEx <i>Asset renewal, replacement and rehabilitation costs</i></p>	<ul style="list-style-type: none"> - Cost of rehabilitating or repairing structures particularly after extreme event such as cyclones 	<ul style="list-style-type: none"> - Costs of rehabilitating, renewing or replacing infrastructure 	<ul style="list-style-type: none"> - Costs of rehabilitating, replacing or renewing infrastructure incurred by users

Life-cycle cost components	Resources	Infrastructure	Demand/Access
<p>Expenditure on direct Support (ExpDS) <i>Post-construction support activities for local-level stakeholders, users or user groups</i></p>	<ul style="list-style-type: none"> - Costs of supporting community-based organisations: watershed management committees, ensuring women and poor participate actively in meetings - Costs of supporting local governments: specialist support at all levels, local-level artisan support - Costs of long-term resource-related IEC and capacity building programmes - Other government departments (e.g. pollution control, planning etc) 	<ul style="list-style-type: none"> - Costs of supporting community-based organisations: water user committees, sanitation and hygiene groups, ensuring women and poor participate actively in meetings - Costs of supporting local and intermediate level government institutions: specialist support at all levels, local-level artisan support - Costs of long-term infrastructure-related IEC and capacity building programmes - Other government departments (e.g. State-government WASH departments) 	<ul style="list-style-type: none"> - Costs of post construction IEC activities incurred by users
<p>Expenditure on Indirect Support (ExpIDS) <i>Macro-level support, planning and policy making</i></p>	<ul style="list-style-type: none"> - IWRM costs: inter-sectoral planning and management of resources at different scales, alignment of these plans, sharing of information, managing a common information base, ensuring ecological flows are maintained - Monitoring (at source) costs: water quality and quantity monitoring networks, water quality laboratories and info bases - IT systems and support costs: Costs of capacity building in IT systems, developing and upgrading IT systems etc - Other government departments (e.g. finance, planning etc) 	<ul style="list-style-type: none"> - IWRM costs: inter-sectoral planning and management of water, power etc infrastructures at different scales, alignment of these plans, sharing of information, managing a common information base, ensuring ecological flows are maintained - Monitoring (at point of supply) costs: water quality and quantity monitoring networks, water quality laboratories and info bases - IT systems and support costs: costs of capacity building in IT systems, developing and upgrading IT systems etc - Other government departments dealing with water (e.g. finance, planning, education, health, etc) - NGO costs for supporting the sector 	

Table 2: Checklist life-cycle cost components – Sanitation & Hygiene

Life-cycle cost components	Resources	Infrastructure	Demand/Access
Sanitation & Hygiene	Costs involved in protecting water resources from disposal of black and grey waste water and storm water.	Cost incurred by service providers when constructing, operating and maintaining sanitation, environmental sanitation and grey and black waste water and storm water infrastructure. Also other costs incurred by service providers that relate to CLTS and/or creating and maintaining demand for and ownership of improved sanitation, environmental sanitation and hygiene practices.	WASH costs incurred by users who routinely access formal, informal and private grey and black waste water and storm water systems to meet demands. These costs include any costs that are not met by the service providers.
CapEx Hardware <i>Capital investment in fixed assets: first time, extension, enhancement and augmentation</i>		<ul style="list-style-type: none"> - Costs of off-site black waste water transport and disposal structures: combined or separate conventional sewerage lines, manholes, overflow structures, shallow/small bore sewerage systems, etc - Costs of off-site black waste water treatment: Conventional sewerage treatment, Constructed wetland, oxidation pond, etc - Costs of sludge disposal: disposal, land for drying, etc - Costs of off-site grey waste water disposal/treatment: closed or open (street) drains, outlet structures - Costs of storm water drainage: open storm water drains, outlet structures, etc - Costs of storage of storm water: pond/tank for surface storage, infiltration wells for groundwater storage - Costs of waste water quality monitoring: test kits; laboratories, vehicles, buildings, sampling equipment, etc - Costs of putting in place billing system for off-site sanitation systems: vehicles, IT costs, etc - For triangulation - subsidies: department/programme contributions to on-site (household) sanitation or grey waste water disposal (e.g. soakpits at homes and public taps, storage for productive use); subsidy costs of public on-site sanitation facilities (e.g. schools, public latrines, health and community centres) 	<ul style="list-style-type: none"> - Costs of on-site (household and public) sanitation: single/double pit latrines, ecosan toilets, septic tanks, etc - Costs of on-site grey waste water treatment/disposal: soakpits at homes and public taps, storage structure for productive use, etc - User costs of on-site storm water disposal: (open) drains, soakpits - One-off connection charges: e.g. individual houses connected to sewerage system

Life-cycle cost components	Resources	Infrastructure	Demand/Access
<p>CapEx Software <i>One-off work with stakeholders prior to construction or implementation, extension, enhancement and augmentation</i></p>	<p>- Cost of environmental impact assessments: EIA and audits (quality and quantity) to identify safe disposal (sites), specialist analysis, use of GIS and remotely sensed data. Also includes assessment to prevent surface or ground water pollution by poor design or construction of on-site sanitation or drainage systems.</p>	<ul style="list-style-type: none"> - Infrastructure assessment costs: assessment of the status of existing infrastructure - Demand assessments costs: assessment of current and future (seasonal) demands for all uses and users that access sanitation infrastructure - Demand creation costs: awareness raising, social marketing, social mobilisation - Design costs: facilitation of stakeholder participation in alternative designs - Engineering design costs: costs of preparing GIS based maps to support and underpin design and planning processes, technical surveys, etc - Costs for hygienic behavior change: costs for campaigns for hand washing, safe sanitation by all, etc. These could be related to Community Led Total Sanitation programmes and/or attempts to reach NGP status (India). - Costs of active stakeholder participation: facilitated multi-level participation in demand creation, demand assessment, planning, etc - Costs of using specialist knowledge: e.g. scenario building as an integral part of planning process - Costs of IEC, institutional development and capacity building: for design/implementation/ management of (alternative) technologies - Regulation costs: safety during construction - Costs of purchasing land on which to locate waste water infrastructure 	<ul style="list-style-type: none"> - Costs for hygienic behavior change: community investment in campaigns for hand washing, safe sanitation by all, etc - Costs of active stakeholder participation: building community level organisations for participation in demand creation, demand assessment, planning, etc (e.g. ODF strategies) - User costs of IEC, institutional development and capacity building: especially in skills to maintain behavior change, maintaining on-site sanitation facilities
<p>Costs of Capital</p>		<p>- Cost of interest payments: World Bank loans and others</p>	<p>- Cost of interest payments: personal or group loans for e.g. household latrines and other microfinance schemes related with sanitation</p>

Life-cycle cost components	Resources	Infrastructure	Demand/Access
OpEx <i>Operating and minor maintenance expenditure</i>	<ul style="list-style-type: none"> - Costs of enforcing regulations relating to pollution of water sources 	<ul style="list-style-type: none"> - Cost of operating and maintaining infrastructure listed in CapEx: fuel, spare parts etc - Costs of O&M: electricity or fuel, labour costs, government contributions - Costs of monitoring - Costs for using of system (e.g. operator paying district or municipality for use of infrastructure (license costs)) - Costs of billing scheme: billing administration, debt collection - Costs of enforcing regulations: checking safe discharge 	<ul style="list-style-type: none"> - Costs of hygienic behavior: e.g. use of soap - Costs of paying service fee (taxes) for connection to sewerage system - Costs of regularly emptying and disposing latrines - For triangulation: costs for using public sanitation facilities
CapManEx <i>Asset renewal, replacement and rehabilitation costs</i>		<ul style="list-style-type: none"> - Cost of rehabilitating or repairing structures/systems particularly after extreme event such as cyclones, floods 	<ul style="list-style-type: none"> - Costs of construction of new latrine pits/latrines: especially in case of double-pit and when initially only one pit was constructed - Costs of non-regular emptying and disposing latrines
Expenditure on direct Support (ExpDS) <i>Post-construction support activities for local-level stakeholders, users or user groups</i>	<ul style="list-style-type: none"> - Costs of long-term environmental-related IEC and capacity building programmes 	<ul style="list-style-type: none"> - Costs of supporting community-based organisations: water user committees, sanitation and hygiene groups, ensuring women, men, children and poor participate actively in campaigns/meetings - Costs of supporting local and intermediate level government institutions: specialist support at all levels, local-level artisan support - Costs of long-term infrastructure-related IEC and capacity building programmes - Other government departments: e.g. water supply 	<ul style="list-style-type: none"> - User costs of participating in IEC, institutional development and capacity building
Expenditure on Indirect Support (ExpIDS) <i>Macro-level support, planning and policy making</i>	<ul style="list-style-type: none"> - IWRM costs: inter-sectoral planning and management of resources at different scales, alignment of these plans, sharing of information, managing a common information base - IT systems and support costs: Costs of capacity building in IT systems, developing and upgrading IT systems etc 	<ul style="list-style-type: none"> - Monitoring costs: waste water quality laboratories and info bases - IT systems and support costs: costs of capacity building in IT systems, developing and upgrading IT systems etc - Cost of developing adequate policies and legal framework: environmental health related to waste water, CLTS etc - Health costs: inter-sectoral planning and management of demand at different scales, alignment of these plans, sharing of information, managing a common information base, ensuring health/hygiene awareness is maintained - Other government departments dealing with sanitation (e.g. finance, planning, education, etc) - NGO costs for supporting the sector 	

