WATER RESEARCH COMMISSION

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WATER INFORMATION NETWORK - SOUTH AFRICA -

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RAINWATER HARVESTING FOR DOMESTIC USE

Report on the National Domestic Rainwater Harvesting Workshop - 21st November 2013

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1 Background

With South Africa being a fundamentally semi-arid and water scarce country, water security is of increasing concern. This situation is further exacerbated by droughts, climate change, over-allocated water, low water quality and ageing infrastructure.

The World Health Organisation (WHO) has identified rainwater harvesting (RWH) as an alternative improved water source, along with protected dug wells, boreholes and standpipes, in provision of water directly to the household for drinking and hygiene purposes. Millions of people are currently using RWH for drinking water purposes in both rural and urban users (UNICEF/WHO, 2012).

Domestic rainwater harvesting has the potential to improve water availability in rural communities in Southern Africa with 55 000 households utilising a rainwater tank onsite as their main source for drinking in 2010 in South Africa (Dobrowski, et.al. 2014). Rainwater harvesting could also provide water for small-scale home based productive activities such as vegetable gardening, which could make a positive contribution towards food security for the people from lower social economic groups (Mwenge-Kahinda, et al, 2010).

In an effort to take rainwater harvesting forward, the Department of Water Affairs (DWA) and the Water Research Commission (WRC) have initiated discussions on rainwater harvesting for domestic use in South Africa to augment water supply to all citizens in the country in order to address the water backlog and achieve the Millennium Development Goal (MDG) of providing all South African citizens with access to basic water services by 2015.

These discussions culminated in a national workshop to assess the potential role of RWH as an alternative water supply solution and engage all rainwater harvesting (RWH) stakeholders on the need for developing RWH guidelines for ensuring the sustainable implementation of rainwater harvesting to assist the sector in the provision of basic water services and water demand management.

2 Workshop Proceedings and Outcomes

The aim of the workshop was to share knowledge and experiences on the concept and technology of rainwater harvesting (RWH) for domestic use and how it fits into the overall picture of appropriate rural and urban water supply, in order to initiate a starter document of addressing research gaps in the field of RWH for domestic use. The workshop was attended by more than 50 participants from the Departments of Water Affairs, municipalities/water boards, non-governmental organisations the private sector, research institutions and from universities. During the workshop the latest research outputs were presented by the WRC, the Council for Scientific and Industrial Research (CSIR), the University of KwaZuluNatal (UKZN), The University of Pretoria (UP) and the University of Western Cape (UWC). These presentations are available on the WRC website at:
http://www.wrc.org.za/Pages/KH_ConferenceProceedings.aspx?dt=14&ms=62.

2.1 Keynote address by the DWA

The workshop was opened by Mr. Siboniso Ndlovu of the DWA with a presentation on the Department of Water Affairs' perspectives regarding domestic RWH. In the search for solutions to inadequate water services delivery in South Africa, the need and potential of RWH to provide interim or intermediate water supply was highlighted.

One of the main intentions of the DWA was to engage stakeholders on the role of RWH as an alternative water supply solution and their intention to develop guidelines for RWH for domestic use to ensure the implementation of sustainable rainwater harvesting programs, to assist the sector in the provision of basic water services and water demand management. Therefore the purpose of the workshop for the DWA was to network with a wide spectrum of experts in the field, such as researchers, implementers and Water Services Authorities (WSAs) that provide RWH to their communities. Other key focus areas presented were installation aspects, water storage tanks, fitness-for-purpose use of harvested rainwater and the application of point of use and treatment systems; rainwater water quality and monitoring), operation and maintenance aspects, and consumer education on effective water use and ownership.

The DWA proposed a project plan they would be following in the next year to mainstream RWH in water services provision. This plan includes consultative meetings with all 9 DWA regions, external stakeholders and other role players in developing RWH in the department.

2.2 Presentations

The presentations from the workshop can be accessed on the WRC website (http://www.wrc.org.za/Pages/KH_ConferenceProceedings.aspx?dt=14&ms=62) and include the following:

- CSIR- Natural Resources and Environment (NRE) - Dr Jean-Marc Mwenge-Kahinda: ***Domestic Rainwater Harvesting in South Africa – challenges and opportunities.***
- University of KwaZuluNatal - Centre for Water Resources Research - Ms Lauren: ***Is domestic rainwater harvesting a sustainable water supply solution?***
- CSIR- Built Environment - Ms Louiza Duncker: ***Performance Evaluation of RWH systems: a case study from the Northern Cape.***
- University of Pretoria - Prof Lize Korsten: ***Evaluation of the risks associated with the use of rainwater harvested from rooftops for domestic use.***
- University of Western Cape - Prof Jackie Goldin: ***Domestic rainwater harvesting in South Africa – A Social Perspective.***

3 Feedback from Breakaway Sessions

The second part of the workshop consisted of break-away group sessions discussing issues, challenges and gaps in RWH for domestic use. The focus points for the groups were:

- ***Regulatory requirements for rainwater harvesting in South Africa.***
- ***Water quality from domestic rainwater systems.***
- ***Funding sources, including incentives and appropriate partnerships for rainwater harvesting in South Africa.***
- ***Sustainability of domestic rainwater harvesting systems (how can it be achieved?) and Climate change and rainwater harvesting.***

3.1 Regulatory requirements for RWH in SA

The following issues, challenges and gaps in policies, legislation and regulations were identified:

- Conflicting Acts, for example the National Water Act (NWA) and Water Services Act (WSA): The NWA classified RWH as an under permissible water use while the WSA stresses that one needs to get authorisation from the Water Service Provider (WSP) to harvest and use rainwater.

- A review of past rainwater harvesting research in South Africa needs to be conducted to inform the policies, legislation, strategies and interventions for the future.
- SA climate change policy acknowledges RWH as one of the strategies defined for adaptation to climate change. However, a regulatory framework needs to be developed for the different categories for rainwater use, such as:
    - drinking water, i.e. for potable use (humans and livestock);
    - irrigation and gardening;
    - commercial use; and
    - industry.
- The Second National Water Resources Strategy (NWRS2) incorporated RWH as one of the ways to augment water supplies to combat current water shortages in the country and spelled out the mitigating factors such as water conservation. RWH needs greater emphasis in the Water Resources Management Strategy and needs to be linked with water demand management and conservation strategies, especially in water-stressed areas.
- RWH should be highlighted as part of the flood mitigating strategy, therefore, be sold to municipalities and other institutions. For instance, capturing a certain amount of water for domestic use can mitigate the issue of flooding, therefore, ensuring sustainability of the drainage systems.
- Commercial use of RWH needs to be clarified in the National water Act. The potential for commercial applications (for example, the Moses Mabida Stadium) needs to be investigated.
- Municipal regulations for RWH: There is a need for specific municipal regulations (e.g. by-laws) to support RWH for domestic use. For instance, in other countries, water from RWH system should be filtered, disinfected and comply with certain health regulations before it could be used for drinking water.
- The regulations to be put in place need to investigate whether distinction will be made between affluent people and indigent people in the use of rainwater.
- Norms and standards need to be developed for the infrastructure of rainwater harvesting systems and need to be compulsory in building regulations. Local municipalities should ensure enforcement of these regulations in new developments.

- SABS standards need to be formulated for the development and production of RWH tanks, as well as for the entire process (storage, installation, construction, water treatment, maintenance, etc.). These standards should be reflected in the building regulations and need to be backed by support from the municipalities.
- Monitoring and enforcement of regulations - It is of no use if regulations exist but is not enforced. A monitoring and support group to implement, enforce and revise regulations need to be in place.
- Currently there are no institutions that formally coordinate RWH research between different departments, research organisations, institutions, etc. Consequently, there is lack of knowledge on research conducted by other institutions.
- Lack of guidelines for domestic RWH systems: A large number of companies are installing RWH systems that are not regulated.
- The social aspect (community participation, users' perceptions, beliefs, needs etc.) of using RWH needs to be investigated to optimise the sustainability of the concept of DRWH.

3.2 Water quality from domestic RWH systems

The research gaps and issues in this regard were identified as the following:

- The safety of rain water for drinking purposes.
- The pathway of contamination in a RWH tank needs to be investigated, for example, underground tanks that are receiving water from surface catchment tend to be more polluted.
- The effects of pollution from roof tops into rainwater harvesting systems need to be investigated and quantified, such as:
    - wind carrying pollutants and contaminants;
    - birds, animals and insects on the roof;
    - dust, debris, paint and rust;
    - chemical contaminants (from mining, heavy metal fall out, pesticide, nitrates, sulphates, etc);
    - environmental contaminants (acid rain, ocean); and
    - microbial contaminants that may affect water quality (*E.coli*, protozoa, viruses, water borne pathogens)
    - Vector contaminants such as mosquitos.

- Other sources of contamination need to be investigated, such as impact of mining, agricultural activities, industrial activities, waste management treatment, traffic, urbanisation, wildlife and the type of roof material.
- Roof top material in use, which include fibre glass, galvanised sheets, cement, tiles, thatch, corrugated iron, painted roof, asbestos, waterproof material, aluminium gutters, etc, needs to be evaluated for optimal harvesting and contamination potential.
- The impact of the geographic area (rainfall pattern, moisture - intermittent vs seasonal, temperature changes, wind speed and direction, vegetation - desert vs rain/fog, over hanging trees, etc) on rainwater harvesting needs to be investigated.
- Effective filtration devices need to be developed, such as nano membranes, meshes, etc., for the prevention of debris (leaves/insects) and pollutants entering the rainwater tanks.
- Materials appropriate for storage tanks (plastic, cement, sealant and corrugated iron, pre-filter, flushing system to remove debris, etc) need to be investigated, specifically to prevent contamination of the water.
- The position of the rainwater collection point needs to be investigated, with regards tof water quality control and appropriate treatment mechanisms need to be evaluated (filtration, UV light, boiling, chemical disinfection (chlorine), reverse osmosis). Control will be system maintenance, which is done twice a year or as a need arises.
- Standard methods for the detection of microbes: standard microbiological methods, molecular methods, standard lab testing, API testing, rapid testing, etc, need to be used.
- Catchment/storage management aspects - there is a need to evaluate the limits/duration that water can be stored in the tank.
- There is need for monitoring, risk assessment, developing guidelines, training and awareness campaigns in the communities on water quality issues in RWH systems.
- The application of water safety nets needs to be evaluated, researched and developed for RWH systems in South Africa.

3.3 Funding, sources, incentives and appropriate partnerships for RWH in SA

The following feedback was received from the session on funding, incentives and partnerships:

- There is a belief that RWH systems are sustainable and an interim solution for water services – this needs to be evaluated.
- Possible sources for funding for RWH were listed as:
    - Donor funds;
    - Subsidies, specifically housing subsidies;
    - the Municipal Infrastructure Grant (MIG);
    - the Municipal Water Infrastructure Grant (MWIG);
    - the Regional Bulk Infrastructure Grant (RBIG);
- Partnership with private companies as part of their corporate social responsibility should be investigated and explored. Developers could donate part of their profits to subsidise rainwater tanks as part of their social responsibility initiatives.
- Possible incentives should be considered in comparison with current initiatives, e.g. subsidy for solar geysers (rebate), rainwater tanks, etc. Bulk purchasing could be an incentive where a group of cooperatives buy a number of rainwater tanks at a discounted rate
- The Equitable Share of each municipality should be considered and used for the operation and maintenance of RWH systems.
- Funding mechanisms should not only consider funding for infrastructure, but should also ring-fence funding for research in RWH, especially to address the gaps in research.

3.4 Sustainability of domestic RWH systems, climate change and RWH

The research gaps and issues regarding the sustainability of RWH systems in the current environment of climate change, poverty reduction and water conservation were the following:

- RWH must be implemented in a financially sustainable way, and because this might not be possible at household level, a bigger approach needs to be taken, such as from a city's perspective, looking at commercial entities.
- How to implement RWH as a solution to water services in the country?
- Consumer awareness raising, training and knowledge dissemination on RWH are critical for the success of the concept.
- The acceptance of RWH systems by the beneficiaries/consumers in both rural and urban contexts needs to be investigated.

- How to ensure water is used for the correct need, i.e. avoid using drinking water quality to flush the toilet.
- RWH systems should be implemented together with storm water management.
- RWH can be used for purposes that do not require good quality water, such as firefighting and cleaning the city. Link RWH with sustainable sanitation, i.e. promoting the use of RWH for non-potable purposes. This can address the strain put on water resources for waterborne sanitation.
- Integrate RWH into Water Resources Management Strategy and plans. It is better to implement regulations for new developments rather than targeting existing infrastructure to comply to regulations. There is a great need for developing a RWH Strategy as part of the regulations for builders and contractors.
- A need was identified for an updated knowledge sharing platform and a RWH association. A need for accurate figures to support the motivation for funding for RWH projects. There is also a need for further research - publication of case studies (dissemination) to share knowledge and supply figures and data.
- The installation RWH systems needs clear objectives, for example, installing RWH systems in an area with little rainfall.
- For sustainability of the RWH system, it would be ideal to involve institutions at local and catchment level whereby Catchment Management Agencies (CMAs) are looking at the totality of water allocation in different areas. At a strategic level, involve water user associations who are in touch with the community and collaborate with NGOs and other cooperatives.

3.5 Other issues

Other issues and research gaps mentioned were:

- Government must see RWH not as an interim measure of addressing service delivery (DWA), but as a long-term strategy – thus there is a need for National RWH Strategy.
- RWH system must be seen as a green initiative.
- AU recognises the importance of RWH to increase its contribution to the total water supply to 3% by 2015.
- There is no evidence that the manufacturers are aware of the research done by the research community.

- A link between municipal water system and RWH system to be considered (particularly in small towns) since they use the same storage system for both. If the municipal system goes down, there is water available from RWH system.
- A need for research so as to ascertain if the local municipalities are really struggling to meet water demands. The findings will address the question on how much will RWH system be a threat to municipalities in terms of sustaining their revenues.

4 Research Framework for Domestic Rainwater Harvesting in South Africa

In order to be able to respond to climate change and achieve sustainable water services delivery in South Africa through research, the water sector needs to agree to a common RWH vision that is supported by a directed aim with the resultant objectives and outputs. A framework for research in RWH for domestic use is necessary to guide and inform the water sector in initiating research and investment on RWH in South Africa. The research framework is intended to provide a high level framework in the development of policies and programmes related to research in RWH by the government. It is intended to be sufficiently broad and flexible to provide the basis for a coordinated and integrated approach for funding research in RWH. This framework outlines the vision, the aim, the objectives and outputs/deliverables for rainwater harvesting in South Africa. This framework will be used as a basis by the WRC in their preparation of the Strategic Framework for RWH Research in South Africa.

4.1 Vision for Rainwater Harvesting in South Africa

The vision for RWH in South Africa needs to be articulated by sector stakeholders and role players in the context of the South African policies and legislation. The Second National Water Resources Strategy (NWRS2) states that: "South Africa has to prioritise, considering the mix of options available, to supply the huge water demands for equitable allocation for development and economic growth. The country will thus consider other potential sources, which include water re-use, desalination, groundwater utilisation, water conservation and water demand management measures, rainwater harvesting, recovering water from acid mine drainage, and the import of water intensive goods" (NWRS2, 2013: iii). This provides the water sector with the mandate to explore the application and implementation of RWH for domestic use in South Africa.

4.2 The aims and objectives for RWH in South Africa

The results from the workshop that was held by the WRC and the DWA in November 2013 articulated the need for research on several levels in order to ensure that RWH becomes an important element of water services delivery in the country. The research gaps were categorised into aims for different levels and into objectives for those aims.

4.2.1 Aim 1: Enabling institutional environment for RWH

The creation of an enabling environment for the application and implementation of RWH, which is regulated and monitored by appropriate policies and legislation at all tiers of government.

4.2.1.1 Objective 1: Water demand management and water conservation

To include RWH in water demand management and water conservation to alleviate the pressure on water services delivery.

Outputs/Deliverables:

- Research results on the role of RWH in water conservation and water demand management.
- Data and results on the impact of RWH on revenue generation in municipalities and a costing model for planning and budgeting purposes.
- Research results on local municipalities meeting their water demands in terms of RWH systems posing a threat to municipalities sustaining their revenues.
- Guidelines on the suitability of RWH systems per locality or geographical space (e.g. district municipality level).
- Research results on RWH as a mechanism to address drought relief.
- Guidelines on decision making process regarding RWH under severe conditions, such as drought, floods, disasters, etc.
- Research results and data regarding alternative RWH technologies as opposed to conventional technologies in collaboration with regional role players for:
    - groundwater recharge;
    - different ways of harvesting rainwater other than using a roof;
    - the right technology for the right location - RWH not a one size fits all.
- Selection criteria for places to install RWH.
- Research results on RWH and artificial groundwater recharge in South Africa.

- Data and research results on the link between municipal water system and RWH system (particularly in small towns since they use the same storage system for both) in terms of supplementary services.
- Expanded research results apart from the WRC project conducted by Wits University on the possibilities of using grey water for flushing toilets to save water in a water-stressed country.
- Guidelines for the involvement of institutions and water user associations at local and catchment level in considering the totality of water allocation in different areas.

4.2.1.2 Objective 2: Appropriate and effective policies, legislation and regulations

To provide information and data in order to guide the development of appropriate and effective policies, legislations, regulations and guidelines for the implementation of rainwater harvesting for domestic use.

Outputs/Deliverables:

- Policy statement of rainwater harvesting for domestic use on:
    - RWH as interim/supplementary solution;
    - RWH as a long term strategy;
    - RWH as a green initiative;
    - Commercial use/application of RWH.
- RWH for domestic use included in national acts and legislation.
- National acts across departments aligned to support RWH implementation in South Africa.
- RWH addressed in national and local strategies and plans.
- Regulations and municipal by-laws to support and enhance rainwater harvesting for domestic use:
- specific regulations (e.g. municipal by-laws) for water quality and health;
- infrastructure
- operation and maintenance
- monitoring and evaluation.
- A regulatory framework for the different categories of use of rainwater, such as:
- drinking water, i.e. for potable use (humans and livestock);
- irrigation and gardening;
- commercial use; and
- industry.
- Institutions, cooperatives, NGOs, CBOs and water user associations at local and catchment levels are involved in the totality of water allocation in different areas.

- Guidelines for domestic RWH systems to assist installation of RWH systems according to regulations.
- A monitoring and reporting system (similar to the BlueDrop) for RWH (could be called the RainDrop).

4.2.1.3 Objective 3: Appropriate and effective funding and funding streams

To optimise and make available the necessary funding, funding streams and funding processes for implementation of RWH in general, and specifically for domestic use.

Outputs/Deliverables:

- An approach to implementing incentives for RWH initiatives to make it the best/optimal way of succeeding.
- Research results on possible incentives for RWH, such as:
    - rebates;
    - bulk purchasing;
    - subsidies;
    - discounts.
- List of possible sources for funding for RWH:
    - donors;
    - subsidies;
    - government grants;
    - research grants.
- Research results on possible partnerships with private companies and developers as part of their social responsibility initiatives.
- Research results on the use of the Equitable Share of each municipality for the operation and maintenance of RWH systems.
- Funding mechanisms for research in RWH, especially to address the gaps in research.

4.2.2 Aim 2: Knowledge/information management and advocacy

The establishment of knowledge and information management systems to advocate RWH to all citizens of South Africa.

4.2.2.1 Objective: Knowledge resource centres

To establish and manage knowledge, information and resource centres for the dissemination of best practices and lessons learnt in order to improve the RWH knowledge levels of all citizens in South Africa.

Outputs/Deliverables:

- Resource centre/information platform for RWH that becomes a body of knowledge on RWH in South Africa.
- Knowledge management strategy for RWH.
- Advocacy campaign for RWH for domestic use.
- User-friendly research outputs for different target groups (decision makers to community members).
- Guidelines and tools for best practices in RWH, specifically for domestic use.
- Mechanisms to promote RWH in policies and legislation.
- Consumer awareness raising, training and knowledge dissemination events.
- Gateways for learning about RWH in rural communities – TV, radio, cell phone, social media (facebook, twitter groups).
- Disseminated knowledge of what has worked/not worked, especially regarding water quality, infrastructure, O&M and monitoring.
- Published and disseminated research data, results and findings of past and existing projects in terms of infrastructure quality, type of materials used, case studies.
- A RWH association with accurate figures to support the motivation for funding for RWH projects.

4.2.3 Aim 3: Rainwater harvesting systems design, operation and maintenance

The setting of regulations, norms and standards for RWH systems design, operation, maintenance and asset management.

4.2.3.1 Objective 1: Norms and standards

To ensure that infrastructure for RWH is designed and developed to comply with policy requirements, legislation, norms and standards of the country in order to accomplish sustainability and effectiveness in water services delivery through RWH.

Outputs/Deliverables:

- Norms and standards for RWH infrastructure, which are compulsory in building regulations and to be enforced in new developments by local municipalities.
- Formulated SABS standards for the development and production of RWH tanks, as well as for the entire process (storage, installation, construction, water treatment, maintenance, etc.) of RWH.

- SABS standards reflected in building regulations and supported by municipalities.
- Clear objectives for the installation of RWH systems, for example, installing RWH systems in appropriate areas where it will be of use.
- Clear standards and guidelines for new housing developments in terms of by-laws, building plans, impact assessments and quality monitoring?
- Optimise the RWH system – focus on other factors over and above the quantity (size of the tank), i.e. the whole system:
    - End use purpose of the water.
    - Quality of water.
    - The technology to be used to reach the quality.
    - The ideal roof type, size rainfall pattern and the size of the tank.
- Alternative ways of channelling water from a household tank into a centralised dam for treatment and distribution back to the users.

4.2.3.2 Objective 2: Guidelines

To provide clear instructions and guidance on operation and maintenance matters of RWH systems for domestic use.

Outputs/Deliverables:

- Results from studies on who should be responsible for the O&M of RWH systems in case of poor households.
- Data and figures on the financial sustainability of the RWH systems at local levels.
- Data and research results on RWH at household level
- Data and research results on RWH at commercial, corporation, industry, private company levels with the main aim of concentrating on the city as whole rather than individual households.
- Research results on the use of rainwater for purposes that do not warrant good quality water, such as firefighting and cleaning the city.
- Research results on linking RWH with sustainable sanitation, i.e. promoting the use of rainwater for non-consumption purposes such as waterborne sanitation.

4.2.4 Aim 4: Water quality aspects for RWH

The requirements, regulations, standards and monitoring of water quality in RWH systems to ensure sustainability an appropriateness.

4.2.4.1 Objective: Water quality

To provide clarification and possible solutions for water quality concerns in RWH, especially regarding domestic use.

Outputs/Deliverables:

- Empirical data to show whether harvested rainwater is safe for drinking.
- Sources of contamination, such as impact of mining, agricultural activities, industrial activities, waste management treatment, traffic, urbanisation, wildlife and the type of roof material.
- The effects of pollution from roof tops into RWH systems from:
  - wind carrying pollutants and contaminants;
  - birds, animals and insects on the roof;
  - dust, debris, paint and rust;
  - chemical contaminants (from mining, heavy metal fall out, pesticide, nitrates, sulphates, etc);
  - environmental contaminants (acid rain, air quality, ocean); and
  - microbial contaminants (E-coli, protozoa, viruses, water borne pathogens).
- Figures and data on vector contaminants: mosquitos, SANS 241, algae, etc.
- Research results on the pathway of pollution and contamination in a RWH tank.
- Data on the effects of roof top material in use, (fibre glass, galvanised sheets, cement, tiles, thatch, corrugated iron, painted roof, asbestos, waterproof material, aluminium gutters, etc,) on optimal RWH potential and least pollutants.
- The impact of the geographic area (rainfall pattern, moisture - intermittent vs seasonal, temperature changes, wind speed and direction, vegetation - desert vs rain/fog, over hanging trees, etc) on RWH.
- Data and information on effective filtration devices, such as nano membranes, meshes, etc., for the prevention of debris (leaves/insects) and pollutants entering the rainwater tanks.
- Figures and data on materials for storage tanks (plastic, cement, sealant & corrugated iron, pre-filter, flushing system to remove debris, etc), specifically regarding active/passive contamination of the water.
- Optimal rainwater collection point positioning and system maintenance in terms of control and treatment (filtration, UV light, boiling, chemical filtration (jik or chlorine), reverse osmosis).

- Comparison between methods for the detection of microbes (standard microbiological methods, molecular methods, standard lab testing, API testing, rapid testing, etc.) for different situations and contexts.
- Data and figures in catchment/storage management in terms of the use and limits/duration period for water stored in the tank.
- Standards on how RWH installation should be done to minimise the need for water treatment/purification.
- Research results on the efficacy of water safety nets for RWH systems in South Africa.
- Water quality monitoring processes and procedures in terms of responsibilities and functions between institutions and households.
- Research results on the influence of health and hygiene within the household on sustained water quality from RWH in terms of contamination points (collection, transport, storage, use).
- Training and awareness campaigns in the communities on issues around water quality in RWH systems.
- Studies on the sustainability of RWH in areas with drought, areas of infrastructure related challenges or emergency water provision and financial constraints in terms of distributing water into household tanks.

4.2.5 Aim 5: Social perceptions, attitudes and practices re RWH

The understanding of social perceptions, attitudes and practices of users of RWH systems and rainwater in order to support policy, implementation processes and achieving sustainable drinking water supply.

4.2.5.1 Objective: Social sustainability of RWH

To ensure that RWH is acceptable, affordable and sustainable for all citizens of South Africa.

Outputs/Deliverables:

- Research results on the beliefs/assumptions of RWH that are currently commonplace (e.g. RWH conserves water and is economical), especially in terms of implementing RWH for domestic use.
- Research results on the acceptance of RWH systems by the beneficiaries/consumers in both rural and urban contexts.

- Research results on the impact of social/user/community aspects in terms of participatory needs assessments, demand responsiveness, perceptions and beliefs on RWH systems.
- Measures and tools to instil an understanding of the RWH concept in communities with limited literacy levels.
- Case studies on the effect of history and indigenous knowledge of communities on RWH in project areas.

4.2.6 Aim 6: Monitoring and evaluation of RWH

The monitoring and evaluation of RWH as a mechanism for water demand management, water services delivery, user satisfaction, improved health and economic growth.

4.2.6.1 Objective: Monitoring and evaluation

To ensure the monitoring and evaluation in RWH initiatives in order to measure water demand management.

Outputs/Deliverables:

- Guidelines on monitoring, risk assessment and evaluation of RWH in the country.
- Research results of the lack of monitoring and evaluation in RWH, e.g. installation of multiple tanks per household, thus wasteful expenditure.
- Results of monitoring and evaluation of the quality and the quantity of a RWH system.
- Study results on what approach (regulation or monitoring) to take in terms of regulating the quality of a RWH system.

4.2.7 Aim 7: RWH for urban settings and industry

The potential of RWH in urban settings to augment municipal water supply, as well as the use of rainwater for industrial purposes.

4.2.7.1 Objective: Urban and industrial settings

To understand the benefits, complications and obstacles for RWH for domestic use in urban settings and for industry.

Outputs/Deliverables:

- Research results and data on the benefits of up-scaling RWH in a city in terms of reduction in storm water, therefore understanding the interconnection of RWH and storm water in urban settings.
- Research results on the difference in dynamics in an informal settlement context to suburban context.
- Research results on the viability of RWH in informal settlements.
- Data and research results on the viability of RWH for industries in terms of reliability of the source.

4.3 Roles and responsibilities

Different stakeholders have different parts to play in the development of the RWH sector. The DWA and the WRC will ascertain the roles, responsibilities and timeframes for the deliverables and outputs by all tiers of government, water boards, catchment management agencies, WSAs, WSPs, NGOs, private consultants, research institutions and the private sector. These roles and responsibilities will be set out in the Strategic Framework for Research in RWH.

5 IMMEDIATE RESEARCH NEEDS

The DWA, the WRC and the participants at the WRC/DWA workshop identified a number of research topics that need to be addressed as a matter of urgency in order to respond to the pressing need for sustainable water services delivery. These topics are listed below.

- Overview of RWH research utilisation and impact (status quo):
- Mapping of existing, planned and on-going research in South Africa and Africa – a desk review of published/grey literature.
- Most effective practices in disseminating research findings to maximise their use.
- Most effective mechanisms to ensure that the right people access the information.
- Policy support and political buy-in:
- Policy and legislation alignment at national and local levels made public through a policy statement regarding RWH from the DWA.
- Regulations for RWH at household level for domestic use in rural and urban settings.
- Norms and standards for RWH for domestic use.
- Guidelines specific to RWH for domestic use:

- Decision-making processes and criteria.
- Infrastructure implementation, norms and standards.
- Water quality for domestic use of harvested rainwater.
- Operation and maintenance.
- Monitoring and evaluation of RWH infrastructure.
- Monitoring and evaluation of RWH as a programme for water services delivery.
- Financial support and mechanisms:
- Subsidy streams and processes.
- Grant allocations and incentives.
- Ring-fenced funding for research and piloting.

6 CONCLUSION AND WAY FORWARD

The purpose of the workshop was achieved in that it facilitated the sharing of knowledge and experiences on the concept and technology of rainwater harvesting (RWH) for domestic use within the overall picture of appropriate rural and urban water supply, and in that it identified the research gaps in the field of RWH for domestic use in South Africa.

The recommendations from the workshop will be merged into a Framework for Research in RWH for domestic use. The Framework will be finalised and published in order to stimulate funding requests for proposals addressing the research gaps identified for rainwater harvesting for domestic use.

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NOTES

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- SOUTH AFRICA -

The WIN-SA lesson series aims to capture the innovative work of people tackling real service delivery challenges. It also aims to stimulate learning and sharing around these challenges to support creative solutions. To achieve this, the lessons series is supported by ancillary learning opportunities facilitated by WIN-SA to strengthen people-to-people learning.

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This document hopes to encourage ongoing discussion, debate and lesson sharing. To comment, make additions or give further input, please visit www.win-sa.org.za or send an email to info@win-sa.org.za.

Our mission is to ensure the body of knowledge in the sector is well managed, readily accessible and applied, leading to improved decision-making and performance, especially of local government.

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