Sustainable Relationships within the Sustainable Sanitation Alliance:
SuSanA Network Analysis Report

Adam Saffer, Ph.D.
Adam.Saffer@unc.edu
University of North Carolina-Chapel Hill
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1. Executive Summary of Report

The Sustainable Sanitation Alliance (SuSanA) seeks to create a space for NGOs (local and international), government agencies, private firms and research institutes to exchange information about sustainable sanitation practices. The partners in SuSanA are located around the world and depend on mediated communication channels to exchange ideas. The SuSanA online discussion forum is a primary space for partners to exchange and receive information about issues in the sanitation sector of development.

This report presents the results of the network analysis of SuSanA partners. This analysis specifically studied the communication channels used and the quality of relationships among partners. The quality of relationships was assessed using measures of social capital. The report also provides four recommendations for strengthening the SuSanA network. The contents of this report provide a quantitative baseline of the sustainable sanitation sector as of May-June 2014. Future network studies can track progress toward enhanced network strength overtime.

Background on the Network Project

In February of 2014, Adam Saffer, Ph.D., contacted the SuSanA Secretariat to study the alliance for his dissertation. As agreed, this report is prepared for the SuSanA Secretariat and SuSanA partners. The report is intended for the Secretariat staff, SuSanA partners, and others working in the sustainable sanitation sector of development.

Primarily the project assessed the communication and relationship quality of the alliance through three different research methods: 1) a textual analysis of documents and the discussion forum, 2) interviews with partners, and 3) a network analysis survey of 107 partners. The textual analysis examined four blogs, 13 factsheets, 39 discussion topics with an average of seven postings per topic, 220 mission statements, 25 quarterly newsletters, 24 organizational documents that included annual reports and planning documents, 40 partner websites, and five videos. The textual analysis familiarized the researcher to the SuSanA network. Interviews further familiarized the researcher with SuSanA and identified communication issues within the alliance. Seventeen interviews were conducted with representatives from SuSanA partners. The textual analysis and interviews contextualize the findings. The network analysis assessed the quality of the relationships between SuSanA partners. The results of the network analysis are reported here.

Summary of the Results

The research looked at the communication between partners. Social network analysis examines how members of a network communicate with one another, form groups, cooperate, share information, and build relationships. Social network analysis focuses on the relationships among partners and assesses the quality of those relationships.

The analysis focused on three areas of the SuSanA relationships: the overall strength of the network, the patterns of relationships and the quality of relationships:

> **Overall Strength of SuSanA Network**
> - SuSanA partners are selective with their relationships to other partners.
> - Partners are selective in the sense that not all partners in SuSanA will have an interest or need to have relationships with others.

Patterns of Relationships
- Partners have a fair amount of diversity in their relationships with different types of SuSanA partners.
- Partners have low diversity of relationships with partners in different economic zones. Few relationships exist among partners from different economic zones.

Quality of Relationships
- SuSanA partners have strong levels of trust, cooperation and information exchange with one another.
- When SuSanA partners use rich communication channels, the levels of trust, cooperation and information exchange are stronger.

Summary of Recommendations

Based on the results of the study, four recommendations are provided to help continue the development of the SuSanA network and further develop relationships among partners.

Recommendation 1: Continue Meeting Around the World

The first suggestion urges the Secretariat and the core group to continue having SuSanA meetings and conferences in different locations. The results of this study found that when partners have the opportunity to meet face-to-face, the social capital within the network increases. Social capital (defined in more detail below) is a way to assess the quality of relationships among partners. With greater social capital, the more likely information and resources will be exchanged among partners. SuSanA is a knowledge-based network that depends on members engaging one another and sharing information, best practices and ideas about sustainable sanitation. Social capital among members helps facilitate knowledge sharing.

Recommendation 2: Establish Regional Nodes with Leading Partners

The second recommendation gives a note of caution about the implementation of regional nodes. In discussions with the Secretariat and partners, there is an interest to develop regional nodes to promote the exchange of information among partners in similar geographic areas. This study found that SuSanA partners have not established relationships with partners from different economic zones. In fact, partners located in advanced economic zones connect most frequently with partners who are also in advanced economic zones and least frequently with partners in developing, low income economic zones. While having regional nodes may appear effective for exchanging information, it may further isolate partners in low-income economic zones from resourceful partners in advanced economic areas. If regional nodes are created then influential partners identified in the cliques, who were mostly from advanced economic areas, may be used to lead regional nodes in different geographic areas. The influential partners have relationships with partners across the network that should be used to build effective regional nodes.

Recommendation 3: Revisit Working Groups' Scope

The third recommendation comes from interviews with partners and suggests the Secretariat consider revising the working groups. Partners interviewed for this study suggested working group nine (Sanitation As a Business & Public Awareness) is too broad and should be separated into two distinct working groups. Some partners were cautious about engaging the working

group because although they are not interested in sanitation as a business, they are interested in public awareness about sanitation.

Recommendation 4: Create More Active Members Through Engagement
The final recommendation is to have more active and influential partners engage the less active and passive partners in SuSanA activities. There is a growing number of passive partners in SuSanA. The network is meant to be informal and does not require partners to be active. However, during interviews with some of the passive partners, some indicated interest in becoming more involved but had not been approached by others about how to become more involved. The Secretariat alone cannot engage all the passive partners. Influential partners in the network could also be used to reach out to the passive partners. A simple campaign could be developed among the active partners to check-in with passive partners. Organizations have carried out similar campaigns where individuals were encouraged to engage with their community neighbors. The campaign resulted in more social capital and stronger communication (Beaudoin, 2007). Active SuSanA partners could be given a list of passive partners to contact and talking points to update passive partners on information and/or changes within SuSanA. Potentially, this could become a semi annual activity where partners check-in with one another.

2. Introduction

SuSanA was formed in 2007 by a core group of 20 organizations in sustainable sanitation development. The founding partners established the alliance to address the lack of progress toward sanitation goals in the 1990 Millennium Development Goals (MDGs). The MDGs of sanitation, set by the United Nations, sought to halve the 2.6 billion people without access to proper sanitation by 2015. The primary goal of SuSanA, as listed on the website, "is to contribute to the achievement of the MDGs by promoting sanitation systems which take into consideration all aspects of sustainability." SuSanA's founding also coincided with the United Nation's decision in 2006 to designate 2008 as the International Year of Sanitation.

The alliance is managed by the German Development Cooperation (referred to as GIZ) and it funds the SuSanA Secretariat staff. The alliance has two types of partners: active and passive. The active partners are members in the working groups and/or core group. The working groups are organized into 12 thematic areas that discuss challenges and opportunities for the thematic areas. Table 1 (on page six) gives a description of each working group.

The working groups provide outputs in the form of factsheets, discussion points, meeting minutes and other publications. The core group is comprised of thematic working groups leaders, representatives from the SuSanA Secretariat, and representatives from a selection of partner organizations. The core group provides strategic direction and advice, plans meetings and events, proposes strategies and makes operational decisions. The active partners help draft factsheets, guideline publications, events, vision documents, and presentations. The passive partners do not engage in either of these groups but receive access to the alliance's online library, discussion forum and e-newsletters. *Figure 1* is a graphic created by SuSanA to explain the structure of the alliance.
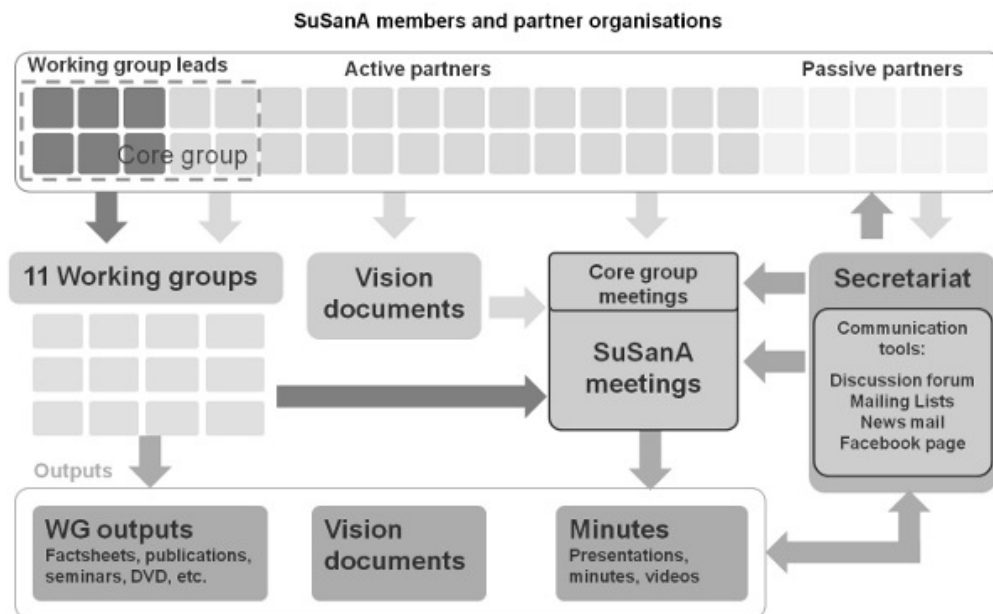

Figure 1. Graphic of SuSanA structure of members and partner organizations.

Table 1: *Thematic Working Groups and Brief Descriptions*

Name	Brief Description
Core Group	Planning meetings and events, proposing future strategies and making operational decisions in between the general meeting dates.
WG 01: Capacity Development	Aims to create a global network to strategically accelerate and influence the capacity development process in the sanitation sector.
WG 02: Finance & Economics	Aims to enrich the weak database on finance and economics, which play a key role in the selection and sustainability of sanitation.
WG 03: Renewable Energies & Climate Change	Raising general awareness for the energy potential of the sustainable sanitation approach and its prospective contribution to reduce dependence on imported or fossil energy sources.
WG 04: Sanitation Systems, Technology Options, Hygiene & Health	Develops possible options on how to improve sanitation systems especially in developing countries.
WG 05: Food Security & Productive Sanitation Systems	Raises awareness for the reuse-oriented sustainable sanitation approach, its prospective contribution to global food security and to promote this approach on a large scale.
WG 06: Cities & Planning	Develops strategies on how cities can adopt an appropriate planning, implementation, and management process that leads towards more sustainable sanitation.
WG 07: Community, Rural & Schools	Raising general awareness for community and rural sanitation by creating discussion for and enhancing networking opportunities.
WG 08: Emergency & Reconstruction Situations	Combines the knowledge from experts in the fields of sanitation with the knowledge from experts in the field of emergency response and reconstruction.
WG 09: Sanitation As a Business & Public Awareness	Creating global awareness of sustainable sanitation options, and on how to make them more accessible and affordable in the local and global market especially for the poor.
WG 10: Operation & Maintenance	Discuss and disseminate relevant information related to best practice examples of operation and maintenance systems for sustainable sanitation by elaborating factsheets, case studies, posters and other information materials.
WG 11: Groundwater Protection	Create awareness and formulate recommendations for the protection of groundwater through sustainable sanitation.
WG 12: WASH & Nutrition	The aim of this working group is to examine the widely neglected and underestimated adverse nutritional impact of lack of safe WASH (WAter, Sanitation, and Hygiene) particularly in emergency situations.

As of February 2014, 217 partners were listed on SuSanA's website database. The partners are categorized into seven types of organizations. A description of each type is provided in Table 2. Partners are located in Africa, Asia, Europe, North America, and South America.

Table 2

Types of SuSanA Partners and Brief Description

Partners Category	Brief Description
Local NGO	A local non-governmental organization which is predominantly active in one or two countries only.
International NGO	An international non-governmental organization which is active in three or more countries. For example: Oxfam, Plan, Terre des homemes, WASTE.
Private Sector	An organization that is operated as a business, be it in a traditional commercial structure or in a social enterprise structure, for a profit.
Education/Research	An institution dedicated to education or research. All universities and research institutes fall into this category.
Government/State-owned Organization	An organization that is either a part of the government (local, regional, national) or is owned by the state or government. For example: SIDA, SEI, GIZ, JICA, DTF, KfW.
Multilateral Organization	An affiliated United Nations entity or an international organization which has been established by formal political agreement. For example FAO, UNICEF, WSP, UN-HABITAT.
Network Association	An organization that serves to facilitate collaborating and contact between people or organizations who have a common goal or social cause. For example: NETWAS Uganda, Cap-Net, GWA, IWA.

The communication among SuSanA partners occurs primarily online. In July 2011, SuSanA received funding from the Bill and Melinda Gates Foundation to launch an online discussion forum. The online forum has become a space where individuals (freelance consultants and representatives of organizations) can post and engage one another. To date, 3,576 unique users have registered and follow the discussion posts. Collectively, the users have posted 7,800 messages on the forum. While this is the primary communication means, some partners meet at face-to-face meetings, events and conferences planned by the SuSanA's Secretariat.

To date there has not been an analysis of the SuSanA network. In 2013, the SuSanA Secretariat surveyed partners to gather information about partners, gauge partners' perceptions about issues, and "map out" the partners' location. This study builds from the 2013 survey but focuses on the communication relationships among the partners. By focusing on the relationships among partners, the results assess the overall strength of the SuSanA network, highlight the influential members in the network and specify opportunities for improving relationships among partners.

3. Methodologies of the Study

The project employed multiple methods for assessing the quality of the SuSanA network. Each method is described in this section.

Textual Analysis

The textual analysis reviewed four blogs, 13 factsheets, 39 discussion topics with an average of seven postings per topic, 220 mission statements, 25 quarterly newsletters, 24 organizational documents (annual reports, planning documents, reports from meetings, and survey findings), 40 partners' websites, and five videos. The textual analysis familiarized the researcher to the SuSanA network.

Interviews

Partners were invited to participate in Skype interviews. Seventeen partners agreed. Partner representatives were asked about their organization's involvement in SuSanA, what they saw as SuSanA's successes and challenges, and about their relationships with other SuSanA partners. The average length of the interviews was 27 minutes. The interviews further familiarized the researcher to the SuSanA network and provided context for the network analysis findings.

Network Analysis Survey

Social network analysis is a method developed by sociologists and management consultants to understand how members of a network communicate with one another, form groups, cooperate, share information, and build relationships. Social network analysis provides a reliable, quantitative way to measure relationships and assess the quality of the relationships.

All SuSanA partners with a current email address on the SuSanA website were sent an invitation to the social network analysis survey. At the time the project began, there were 217 listed SuSanA partners. Multiple email reminders were sent to non-responding partners.

The researcher (Adam Saffer) called and checked the websites for partners that did not respond to the email invitations. Some partners are inactive or passively apart of the alliance; therefore, the researcher refined the list of partners to include active partners. Active partners were defined following SuSanA Secretariat's guidelines for membership: current contact person, working website and SuSanA logo on website. Partners were listed as inactive when there was not a working telephone number, no reply to voice messages, no current contact, or no working website. Eighty partners were listed as inactive and 137 were identified as active.

Representatives from 107 active partners finished a usable portion of the network survey. One organization had two representatives complete the survey. Their responses were averaged together and analyzed as a single response from the organization. The response rate was 78%; network analysis requires a minimum of 70% response rate for meaningful data analysis.

The survey (Appendix A) asked partners to identify the relationships with other partners and assess the quality of those relationships. The quality of partner relationships was assessed based on the following elements: *channels of communications used, importance of the relationship, trust, cooperation,* and *information exchange*. The elements assessed SuSanA's social capital.

Network analysis surveys ask respondents to represent their organizations and rate their experiences with other organizations. The results of network analysis provide visual and numeric analyses based on respondents' ratings. For example, SuSanA partners were asked to identify other SuSanA partners they had worked with in the past year. Answers were aggregated to show the partners identified the most. The average score shows the general level of perceptions about the organization on a particular question. This method is useful for identifying leaders within a network, strong and weak relationships, and organizations that connect or do not with others.

Understanding network graphs (used below to illustrate the findings) requires some explanation. Nodes on a network graphic are the symbols (dots, squares, triangles, etc.) that represent the SuSanA partners. The lines between the nodes are the relationships partners identified having with another partner. Arrows are used to indicate the direction of a relationship between two partners. If a line leaves from a node and the arrow points to another partner, the line means the SuSanA partner identified having a relationship with the receiving partners. Arrows going into a node represent the number of other partners that identified having a relationship with that specific partner. A two-way arrow between two partners means that both partners identified having a relationship with each other. Two-way arrows show that a relationship between partners is reciprocated, which is good for a network because both organizations share the same understanding of their relationship.

The easiest way to understand network graphs is to look at the size of the node and the lines going in or out of a node. A larger node representing a SuSanA partner indicates the more times it was identified by others in the network as important, cooperative, trustworthy or significant for information exchange. Explanation for each visual is provided below the network graphics.

Organizations represented by large node sizes with many arrows going into the partner's node have numerous relationships with other partners and those partners value the relationship. When a partner receives more relationships, their node is positioned at the center of the network, which indicates they have numerous connections to other partners. Nodes with small squares, showing a few arrows going in and out of them are positioned far away from the center of the network do not have as many relationships with other partners that are in the center of the network.

The codes and full names of organizations are listed in Appendix B.

4. The SuSanA Network, May–June 2014

Overall Strength of SuSanA Network
A network's strength is determined by the relationships among network members. When members of a network have relationships with others there are positive outcomes: information is shared, organizations partner with others on projects, and lend support to one another. Networks are measured by their density. Density identifies the relationships in a network, illustrates the overall connectedness of a network and offers a picture of the potential information flow within a network.

Research suggests that density offers evidence of order in a network. Kauffman (1993, 1995) found that moderate density in biological systems indicates a transition to order. Taylor and Doerfel (2003) suggested the density is also a way to assess the order in interorganizational networks similar to SuSanA. When there is order, as indicated by density, networks are more capable of collective activities.

Density is one way to measure social capital within a network. Density as a social capital measure is structural. The measure is structural in the sense that it is based on the frequency of the relationships. More relationships increase the network structure while fewer relationships suggest a weak network structure. Social capital is a term used to discuss the value relationships provided to a network. Network analysis can calculate the overall density of a network based on the ties within a network. A tie is a relationship between two partners. Density is one of two calculations the study used to assess the social capital in SuSanA. Density is calculated by taking the total number of *possible* ties among SuSanA partners over the *actual* number of ties that exist among partners.

A fully connected network would have a density score of 1.0, which would indicate that every partner has relationships with all other partners. This is quite rare in mediated networks. Low density scores are often between .15 and .40 and suggest that a majority of the possible ties between organizations are not fulfilled. This low density is more common in mediated networks.

The network analysis revealed that the SuSanA network density (strength) is .041. Meaning that only 4.1% of the possible relationships in the SuSanA network exist. The average number of connections in the network was eight, meaning that on average partners have relationships with eight other SuSanA partners. There is great variability in the number of relationships partners indicated. Figure 2 illustrates the density by visualizing which partners indicated relationships with others.
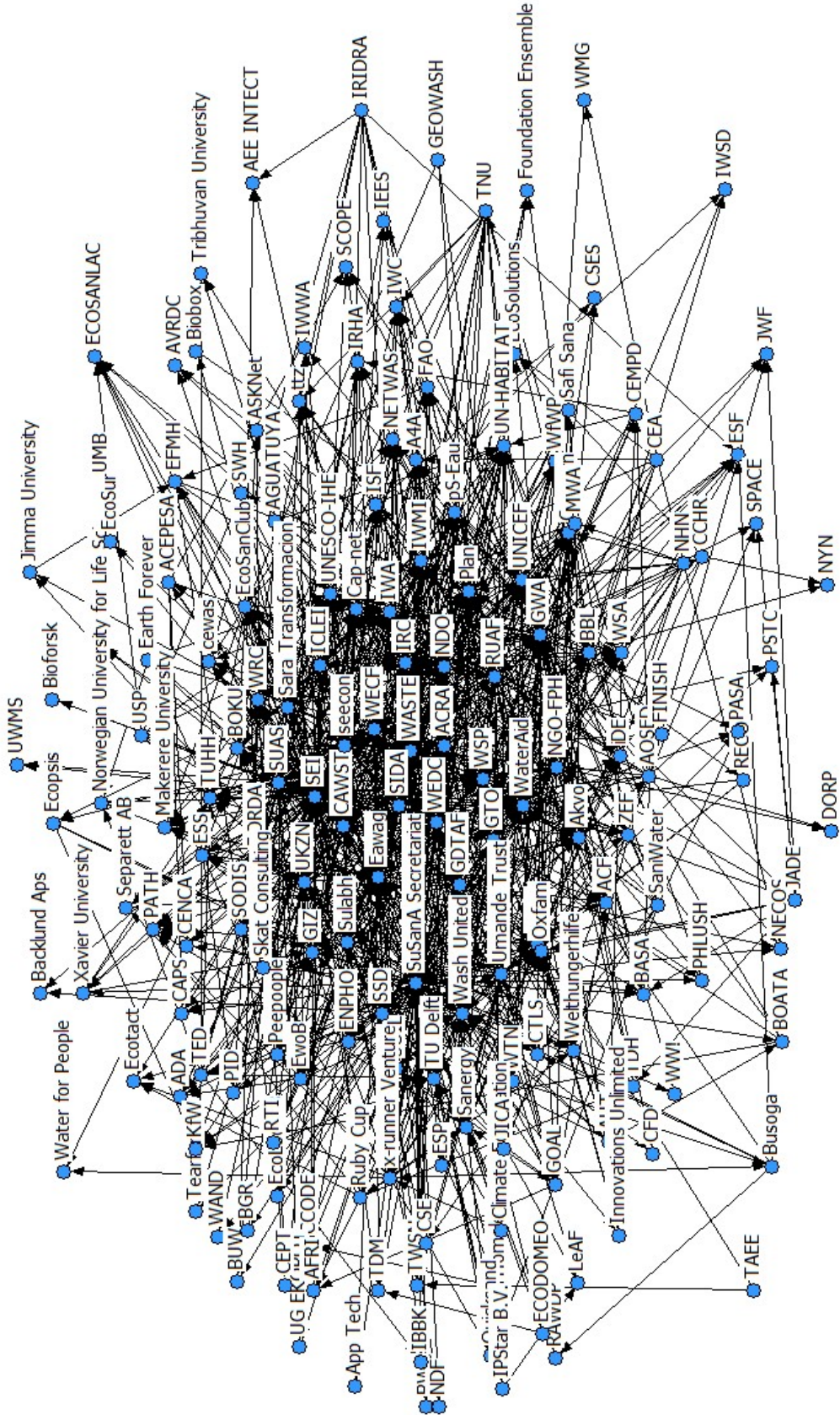
Figure 2. Illustration of the SuSanA network based on partners' relationships. Partners that did not indicate relationships were removed. Those in the center sent and received more relationships than those on the network periphery.

The low-density finding must be contextualized. When reading this result it is important to remember SuSanA is an informal and relatively young network that relies on mediated communication among partners. Partners are not required to make contributions or participate in the network and collaborate with each other through email, calls and video conferencing. In a network this expansive, it is not realistic to expect partners will have relationships with several other partners. The low network density suggests that partners are selective with their relationships to other partners. Partners are selective in the sense they will have relationships with those they find valuable.

Given that partners must be selective with their relationships, this research turned the focus to the existing relationships within the network. The following analyses looked at the patterns of relationships among partners. The next section looked at the patterns of relationship by considering the formation of cliques and the diversity of connections among partners.

Patterns of Relationships in the SuSanA Network
The patterns of relationships between partners illustrate the strength of the network. There are a number of methods for studying these patterns. The low-density scores reported above suggest that partners are selective with the relationships they have with other partners. To delve further into the relationships, there are two network methods for studying the patterns of partners' relationships: clique analysis and diversity of relationships. Each is explained further below.

Cliques Analysis
Cliques analysis studies connections between partners that form cliques within a network. Cliques are groups of partners connected to many of the same partners. For example, some partners indicated relationships that were similar to the relationships other partners reported. The partners were connecting to the same or similar organizations. The similarity in their connections creates network cliques. Cliques identify where partners have overlapping relationships.

The word *clique* can often have pejorative connotations. Clique, as is used in network terminology, identifies influential partners. In the SuSanA network, there are 23 cliques. The cliques are primarily formed by five key partners: (1) SuSanA Secretariat, (2) Seecoon, (3) Eawag, (4) Stockholm Environment Institute, and (5) WASTE. The SuSanA Secretariat was found in 16 of the 23 cliques. Eawag was a part of six cliques, the Stockholm Environment Institute had connections to five cliques, and Seecon and Waste appeared in four cliques each. Figure 3 (next page) displays the patterns of the connections and the cliques.
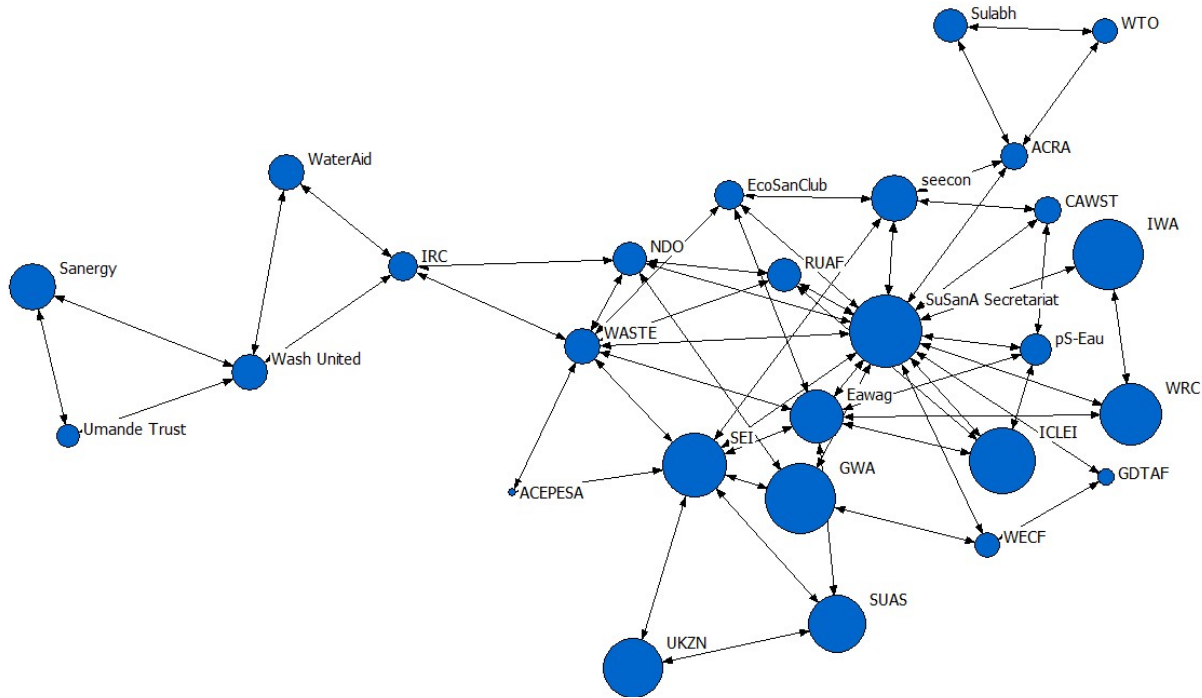
Figure 3. Visual of SuSanA's network cliques. The larger nodes (blue dots) indicate more times a partner is in a clique. For example, SuSanA Secretariat is in the most cliques and has a larger node than EcoSanClub, which participates in fewer cliques.

The clique analysis is meaningful because it identifies the partners that are taking a lead within the network. Overall, there are few relationships within SuSanA but when there are relationships the relationships are overlapping. The overlap forms cliques. Cliques can be used to identify partners leading the network. While the low density measure is concerning, it is less concerning with the results of the clique analysis that show overlapping relationships.

The clique analysis focused on a specific set of partners. The next section returns to a broad focus on the network and studies whether partners are connecting to other similar partners. In networks that exchange information, it is important to see partners connecting with different types of partners. When partners connect to similar types of organizations, there is greater likelihood of redundant information being shared. Effective knowledge-based networks have partners that connect to different types of partners where they can access new information.

Diversity of Relationships
To assess the diversity of connections among SuSanA partners, an analysis that studies the similarities and differences among partners was employed. The *E-I index* assesses the diversity of relationships by comparing the number of relationships a partner has with similar partners and different partners. Diversity of relationships provides an indication of how well information and resources are being shared. Low diversity of relationships indicates partners are exchanging information and resources with other partners similar to themselves and there is less likelihood new information is being shared. Diversity of relationships indicates new information and resources are being exchanged among partners of all different types.

For this research, the E-I index studied the similarities and differences in two ways. One E-I index looked at how SuSanA partners have relationships with partners of the seven types (i.e. local NGOs, private firms, government agencies, etc.). Another E-I index was used to study how partners connected to partners in the same or different economic zones.

The E-I index of partners' relationships to other types of partners found a good level of diversity. Partners were classified as one of the seven organization types that are listed the on SuSanA website. The organization types include: local NGO, international NGO, private sector, education/research, government/state-owned organization, multilateral organization, network/association. The results revealed SuSanA partners are connecting other types of organizations.[1] Multilateral organizations were the most likely to connect to different types of organizations. Interestingly, the international NGOs connected the least to private firms, education/research groups, and local NGOs.

The E-I index of partners' relationships to other partners based in similar or different economic zones must be discussed further. All partners were classified as being in advanced, developing, or low income developing economic zones based on the location of their headquarters. The economic zone classifications were defined by the International Monetary Fund's 2014 report. The analysis suggests that SuSanA partners are connecting to organizations in similar economic zones.[2] In fact, partners in the advanced economic zones connected to partners in the same economic zone more frequently. Partners in developing low-income economic zones had the most diverse connections to partners in other economic zones. Partners from the advance economic areas rarely connect to partners in the developing or developing low-income economic zones. Furthermore, the partners in the developing low-income economic zones were found to be the most likely of all partners to seek out relationships with partners in advance economic areas and in developing areas.

In sum of the patterns of relationships among partners, this study found the emergence of cliques among influential partners and a fair amount of diversity in partners' relationships with different types of partners. However, there is a noteworthy finding that partners in advance economic zones are more rarely connected to partners from the developing and developing low-income economic zones. The next section turns the focus towards the quality of relationships among SuSanA partners and the assessment of social capital within the network.

Quality of Relationships in the SuSanA Network
To this point in the report, the research suggests that: (a) SuSanA partners are less likely to *directly* connect with other partners; (b) the patterns of partners' relationships form cliques among the leading organizations; and (c) partners have a fair amount of diversity in their relationships with different types of partners but less diverse relationships with partners from different economic zones. Now the focus turns to the quality of relationships among partners by examining the importance of communication relationships, the communication channels used, and the social capital measures of trust, cooperation and information exchange.

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[1] E-I index of 0.55, with an expected value of 0.64. Multilateral organizations were the most likely to connect to different types of organizations (group level E-I index score: 0.915). International NGOs were the least likely to

[2] E-I index of 0.092, with an expected value of .251.

Importance of Partners as Communication Sources
Peers' perceptions of others in a network have a significant affect on relationships. When partners see each other as important, the relationships are strong. SuSanA partners were asked to rate, on a scale from 0 (not at all important) to 10 (extremely important), the importance of their communication relationships with partners. Partners' scores were aggregated to identify the SuSanA partners others see as important communication partners. An important communication partner shares relevant information, provides advice and support, etc.

The ten most important communication partners in descending order were: the World Bank's Water and Sanitation Program (34), Water Aid (33), Eawag (33), International Water and Sanitation Centre (30), WASTE (29), SuSanA Secretariat (29), AGUATUYA (27), World Toilet Organization (26), UN-Habitat (26), and GIZ (25). The scores in parentheses represent a partner's accumulated communication importance score. A partner's score is derived from relationships with other partners that indicated their level of communication importance with that partner. Other partners view the top ten partners as important communicators. *Figure 4* on the next page illustrates the communication importance scores.

Figure 4. Visual of communication importance in SuSanA network. The larger nodes (blue dots) indicate higher communication importance scores. For example, WaterAid is a larger node because partners identified WaterAid as an important communication partner.

The next aspect of relationship quality was the social capital elements of trust, cooperation and information exchange.

Reassessing SuSanA's Social Capital

The initial assessment of social capital using the density measure only examined the presence and absence of relationships among partners. The density of the SuSanA network suggested there is low social capital among partners. However, the uniqueness of SuSanA must be considered. SuSanA is an informal network; partners are not required to engage others or contribute resources. In fact, many of the partners indicated in the interviews their membership was primarily to receive information for the discussion forum. Such network characteristics will lead to less frequent relationships across the network. The low frequency of relationships lowers the density of the network.

The SuSanA network is a informal network. The density score is based on the frequency of relationships and does not account for SuSanA's informal nature. A further assessment of the social capital is necessary. Social capital is more than the frequency of relationships (Kikuchi & Coleman, 2012). As stated before, social capital is a term used to discuss the value of relationships provide to a network. When partners have quality relationships, they can exchange information and resources, and if necessary engage in collective actions (Sommerfeldt, 2013).

To assess the quality of relationships (social capital), the SuSanA partners indicated their trust, level of cooperation and willingness to exchange information with other SuSanA partners. Trust, cooperation and information exchange are the most commonly used measures for social capital.[3]

These results contrast the density results discussed earlier. The low density of the network suggested that partners are selective with the relationships they form with other partners. The clique analysis supported this assumption by identifying the patterns of partners' relationships. Here the data revealed that when SuSanA partners establish relationships, they develop strong relationships. This is a promising finding for the long-term health of the network.

When discussing social capital it is also necessary to consider another aspect of the SuSanA network: the dependence on mediated communication. The final part of assessing relationship quality within SuSanA considered how communication channels influences social capital.

Communication Channels

Relationships are formed through communication and communication channels influence relationship quality. Research on social capital has found that the richness of communication channels can affect the social capital within networks (Ahn & Ostrom, 2008; Ostrom, 2003; Taylor & Doerfel, 2003). SuSanA partners are geographically dispersed and rely on mediated forms of communication such as email, Skype, discussion forums and etc. Communication channels vary in their media richness. Less media rich channels are not able to convey nonverbal information and other important communication aspects that rich communication channels like face-to-face discussions can.

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[3] The trust, cooperation and information exchange scales ranged from one to seven. The Cronbach's alphas (α), means (M), and standard deviations (SD) for the measures are reported. trust (α = .86, M = 4.98, SD = 0.42), cooperation (α = .91, M = 5.38, SD = 1.25) and information exchange (α = .90, M = 5.27, SD = 1.28).

SuSanA partners identified the channels of communication they used with each of their relationships. There were three categories of media richness. Low media richness channels were considered email, text messages, indirect contact or fax. Moderate media richness included phone, Skype and social media. The richest communication channels included face-to-face meetings or attending SuSanA related events/conferences. As expected, email, Skype and the SuSanA discussion forum were the most frequently used communication channels.

Of interest to this research was how the communication channels influenced partners' relationships. A correlation analysis specifically designed for network analysis found that when partners use richer communication channels, they have stronger levels of trust, cooperation and information exchange.[4] For example, when partners meet face-to-face or use Skype to talk, there are stronger indications of social capital. This finding is considered further in the recommendation concerning the meeting locations.

The final section of this report provides recommendations and next steps of the research.

5. Recommendations and Next Steps

Recommendation 1: Continue Meeting Around the World
SuSanA has hosted meetings and/or conferences across the world. During the interviews, some of the partners commented how they became involved with SuSanA because of a SuSanA conference or meeting near them. The network analysis found that when partners engage in face-to-face communication or meet in person at conferences or meetings, the quality of relationships among partners increases. The diversity of meeting locations has allowed for rich communication to occur and subsequently increases social capital with the SuSanA network. The Secretariat should continue hosting meetings in different geographic areas and explore way in which partners located in different areas can meet outside of organize SuSanA activities.

Recommendation 2: Establish Regional Nodes with Leading Partners
Another recommendation for SuSanA is to implement regional nodes with caution. The Secretariat and core group meeting notes indicate there is some interest among partners in developing regional nodes. The regional nodes are being described as a means for partners in certain regions to exchange information. However, the research findings suggest that partners are frequently only connecting with other partners located in the same economic zones. Local NGOs and partners in developing low-income areas connect most often with other partners in the same economic zone and second most often with partners headquartered in advanced economic zones. Implementing a regional node structure for SuSanA may further isolate some of the local NGOs in developing low-income economic areas. One method to avoid further isolating partners from low-income economic zones could have influential partners lead the regional nodes. The influential partners found in the clique analysis were mostly from advance economic areas and would be most likely to have the resources and already established relationships to engage partners from specific regional areas.

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[4] Richness of communication channels was significantly, positively correlated with trust ($r = .73, p = < .01$), cooperation ($r = .70, p = < .01$), and trust ($r = .64, p = < .01$). r = Pearson's correlation coefficients.

Recommendation 3: Revisit Working Groups' Scope

Next is the suggestion is to revisit the scope of the working groups. During interviews with partners, the researcher asked partners to discuss opportunities for improvements within SuSanA. Two reoccurring comments emerged about the working groups. First, some partners have heard of the working groups but have not been asked to become involved with a specific working group. The working groups leaders may want to take the opportunity to invite new members to join a working group.

The second reoccurring comment came from partners already involved in working groups who suggested breaking up some working groups into more focused groups. The concern is that some working groups have too broad of scope. Specifically, working group nine, Sanitation As a Business & Public Awareness, was mentioned as a working group that has too broad of focus and should be separated. The visual (Figure 5) below shows all the working groups with Sanitation As a Business & Public Awareness in the bottom left corner. There are a high number of partners that identified being a member of the Sanitation As a Business & Public Awareness working group. However, they are also indicated being in other working groups. The data suggest members in this group have many of interest or are trying to get involved in other ways.

Figure 5. Partner's membership in working groups.
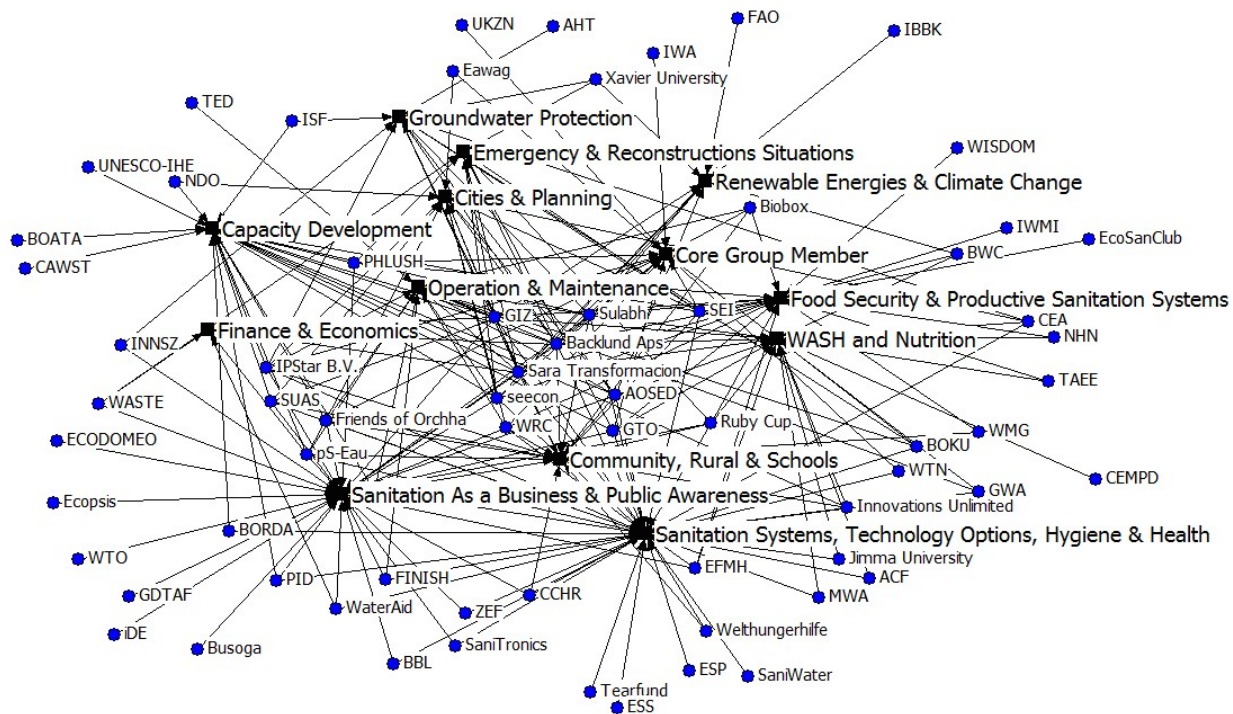
The working groups provide opportunities for cross collaboration among partners operating in different areas of sanitation. The groups also reduce this large network into small, more tangible relationships. The relationships formed within working groups and continue the development. More focused working groups could allow for more engagement opportunities among members.

Recommendation 4: Create More Active Members Through Engagement
The final recommendation calls for influential partners to engage passive partners. In soliciting partners to participate in the interviews, a number of invitees commented that their organization was "no longer active in SuSanA" or "had not been involved for some time." Further investigation into why these partners saw themselves as no longer active was a lack of connection to the network. Simply put, one interviewee said his organization become passive "because nobody has asked us to do anything." Some effort must be made to engage the passive partners and invite them to engage in SuSanA activities.

The Secretariat alone cannot engage all the passive partners. Influential partners in the network could be asked to reach out to the passive partners. A simple campaign could be developed among the active partners to check-in with passive partners. Organizations have carried out similar campaigns where individuals were encouraged to engage (talk) with their community neighbors. The campaign resulted in more social capital and stronger communication (Beaudoin, 2007). Active SuSanA partners could be given a list of passive partners to contact and a set of talking points updating passive partners on important information and/or changes within SuSanA. Potentially, this could become a semi annual activity where partners reach out to one another to check-in.

Next Steps in 2015
There are a number of exciting opportunities for the SuSanA Secretariat and partners as the network continues to evolve and mature. The aim of this project was to assess the quality of the network and the communication among members. This study can act as a baseline for future studies. The recommendations presented address some of the most pressing issues that emerged.

In the next year, SuSanA can carryout a campaign for partners to engage other partners. This could be a low resource campaign that simply provides active partners with a list of partners to contact. The Secretariat may also provide the active partners with some talking points about recent development within SuSanA and areas of need. The purpose of this campaign would be to give passive partners opportunities to become reengaged in SuSanA activities.

In 2015, another network analysis should be carried out in October 2015. A future network analysis could be condensed and more focused on key areas of the network. Relationships are critical to networks. Relationship quality is important to knowledge exchanging networks. Monitoring partners' relationships through network analysis can provide informative diagnostics to the health of the network.

Now that this report is submitted to the SuSanA Secretariat, participating partners can expect to receive network illustrations. The visual depiction of the network will be emailed to the partners who listed an email address at the end of the network analysis survey. If partners do not receive network illustrations, they can contact the researcher at Adam.Saffer@unc.edu.

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Appendix A
Network Analysis Questions

Communication/Interaction Network
The following questions are regarding your communication relationships with organizations you interact with in the coalition. Please think of the organizations you have worked with over the past year regarding the focal coalition. On a scale from 1 (strongly disagree) to 7 (strongly agree), please indicate your disagreement or agreement with the follow statements.

- Q1: On the roster below, select the organizations with which you have worked with over the past year regarding the focal coalition? [Roster of all SuSanA partners]
- Q2: On a scale from 0 (not at all important) to 10 (very important), rate the value of your organization's communication relationships with each organization listed. [Roster of all SuSanA partners selected in Q1]
- Q3: On average, how often do you talk to representatives from each organization listed? (daily, weekly, monthly, quarterly, less often, none [Reserve code: daily = 5, none = 0). [Roster of all SuSanA partners selected in Q1]

Richness of Communication Channels
- Q4: Please indicate each medium you use to communicate with the following organizations. [Roster of all SuSanA partners selected in Q1]
  - *Respondents will be given a range of options that are valued as follows:*
    - 1 = fax, email, text message, or indirect contacts
    - 2 = phone, Skype (video/audio conferencing)
    - 3 = face-to-face meetings

Communication Importance
- Q5: From time to time most people discuss important matters with other people. Looking back over the last year—what are the organizations on this roster with which you discussed matters important to your organization?

  Please rate the intensity of your organization's relationship with each organization based on the descriptions below: [Roster of all SuSanA partners selected in Q1]

  1. Are you **especially close** with this organization in the sense that this is one of your closest professional or personal contacts?
  2. Or are you merely **close** in the sense that you interact with the organization, but do not count it among your closest professional or personal contacts?
  3. Or are you **less than close** in the sense that you don't mind working with the organization, but you have no wish or need to develop a relationship?
  4. Or are you **distant** in the sense that you do not interact with the organization unless it is necessary?

Trust
- Q6: The following questions are regarding your trust in the representatives and organizations you interact with in the coalition. On a scale from 1 (strongly disagree) to 7 (strongly agree), please indicate your disagreement or agreement with the follow statements. [Roster of all SuSanA partners selected in Q1]

    Interorganizational Trust
    1. Organization X has always been evenhanded in its negotiations with us.
    2. Organization X may use opportunities that arise to benefit at our expense. [R]
    3. Based on past experience, we cannot with complete confidence rely on Organization X to keep promises made to us. [R]
    4. We are hesitant to transact with Organization X when the specifications are vague [R].

    Interpersonal Trust
    1. My contact person at Organization X has always been evenhanded in negotiation with me.
    2. I know how my contact person at Organization X is going to act. S/he can always be counted on to act as I expect.
    3. I have faith in my contact person at Organization X to look out for my interests even when it is costly to do so.
    4. I would feel a sense of betrayal if my contact at Organization X performance was below my expectations.

Cooperation
- Q7: The following questions are regarding the type of relationships you have with other organizations in the coalition. On a scale from 1 (strongly disagree) to 7 (strongly agree), please indicate your disagreement or agreement with the follow statements. [Roster of all SuSanA partners selected in Q1]

    Cooperation
    - This organization help my organization:
        o accomplish our goals.
        o have access to useful information.
    - This organization:
        o engages in respectful activities.
        o collaborates with my organization.
        o overall, provides important information.
    - My organization:
        o relies on this organization for important info.
        o trust information from this organization.
        o Can be confidential with this organization

- Information from this organization is:
  - ○ accurate
  - ○ truthful

Competition
- This organization:
  - ○ hinders my org's access to funding
  - ○ should be achieve more than it is
  - ○ provides misleading information
  - ○ is deceptive

Information Exchange

- Q8: The following questions are regarding the information you receive from organizations in the coalition. On a scale from 1 (strongly disagree) to 7 (strongly agree), please indicate your disagreement or agreement with the follow statements. [Roster of all SuSanA partners selected in Q1]

  1. I trust the information I receive from this organization.
  2. The information I receive from this organization is timely.
  3. The information I receive from this organization is accurate.
  4. How often do you receive information from each organization?

End of Survey [Thank you message for participating message.]

Appendix B
Alphabetical Roster of SuSanA Partners' Names,
Abbreviations and Organization Types

ACEPESA	ACEPESA	NGO
ACRA	ACRA	iNGO
Action Centre la Faim	ACF	iNGO
AEE INTECT	AEE INTECT	Research
African Applied Health, Education, And Development	Africa AHEAD	Network
African Sanitation Knowledge Network	ASKNet	Network
AFRIpads Ltd.	AFRI	Private
AGUATUYA	AGUATUYA	NGO
AHT Group AG	AHT	Private
Akvo	Akvo	iNGO
ALUF Department of Geography	ALUF	Research
Amka	Amka	Private
An Organization for Socio-Economic Development	AOSED	NGO
Appropriate Technology	App Tech	Research
Aqua for All	A4A	NGO
Arche Nova	Arche Nova	iNGO
areal GmbH	areal GmbH	Private
Austrian Development Agency	ADA	Gov
AVRDC The World Vegetable Center	AVRDC	Research
Backlund Aps	Backlund Aps	Private
Bangladesh Association for Social Advancement	BASA	NGO
Banka BioLoo Pvt Ltd	BBL	Private
Bauhaus-Universität Weimar	BUW	Research
Better World Cameroon	BWC	NGO
Biobox	Biobox	Private
Bioforsk	Bioforsk	Research
Birzeit University - Institute of Environmental and Water Studies	IEWS	Research
BOATA	BOATA	Private
BOKU University Institute of Sanitary Engineering and Water Pollution Control	BOKU	Research
Bremen Overseas Research and Development Association	BORDA	iNGO
Busoga Trust	Busoga	iNGO
Capacity Building for Integrated Water Resources Management	Cap-net	Network
Center for Advanced Philippine Studies	CAPS	NGO
Center for Development	CFD	NGO
Centre for Affordable Water and Sanitation Technology	CAWST	iNGO
Centre for Community Health Research	CCHR	NGO
Centre for Community Organisation and Development	CCODE	NGO
Centre for Environmental Management and Participatory Development	CEMPD	NGO

Centre for Science and Environment	CSE	Research
Centre of Sustainable Environmental Sanitation	CSES	Network
Centro Ecologico Akumal	CEA	NGO
CEPT	CEPT	Research
cewas	cewas	Private
Climate Foundation	Climate Foundation	iNGO
Community Cleaning Services	CCS	Private
Community Led Total Sanitation	CTLS	NGO
Community Self Improvement	COSI	NGO
Concern Worldwide	Concern	iNGO
CWSR- University of Technology	CWSR	Research
Decentralised Environmental Solutions	DES	NGO
Deutsche Gesellschaft für Internationale Zusammenarbeit	GIZ	Gov
Development Organization of The Rural Poor	DORP	NGO
Devolution Trust Fund	DTF	Gov
Dunster House Ltd	Dunster House	Private
Earth Forever	Earth Forever	NGO
East Kolkata Wetland Management Authority	EKWMA	Gov
Eawag/Sandec	Eawag	Research
ECODOMEO	ECODOMEO	Private
Ecological Sanitation for Latin America and the Caribbean	ECOSANLAC	Network
EcoLoo AB	EcoLoo AB	Private
Ecopsis sa	Ecopsis	Private
EcoSan Club	EcoSanClub	iNGO
Ecosan Services Foundation	ESF	NGO
EcoSolutions	EcoSolutions	NGO
EcoSur	EcoSur	Network
Ecotact	Ecotact	Private
Engicon	Engicon	Private
Engineers without Borders, Germany Chapter	EwoB	iNGO
Environment and Public Health Organization	ENPHO	NGO
Environmental Information System	ENVIS	NGO
Envirosan Sanitation Solutions	ESS	Private
Eram Scientific Solutions	ESP	Private
Ethopian Federal Ministry of Health	EFMH	Gov
Excloosive Ltd.	Excloosive	Private
Federal Institute for Geosciences & Natural Resources	BGR	Gov
Financial Inclusion Improve Sanitation and Health	FINISH	Network
Food and Agriculture Organization of the United Nations	FAO	Multilateral
Foundation Ensemble	Ensemble	NGO
Foundation SODIS	SODIS	NGO
Friends of Nature	FON Nepal	NGO

Friends of Orchha	Orchha	NGO
Gender and Water Alliance	GWA	Network
German Toilet Organization	GTO	NGO
Global Development Research Center	GDRC	Research
Global Dry Toilet Association of Finland	GDTAF	NGO
GOAL	GOAL	iNGO
Guarantee Environment on Water Sanitation and Hygiene	GEOWASH	NGO
Homeless International	Homeless	iNGO
ICLEI	ICLEI	Multilateral
iDE	iDE	iNGO
Indian Water Works Association	IWWA	Network
Innovations Unlimited	IU	Private
INREM Foundation	INREM	NGO
Institute for Sustainable Futures	ISF	Research
Institute for Technology Assessment & Systems Analysis	ITAS	Research
Institute of Water and Sanitation Development	IWSD	Research
Instituto de Desarollo Urbano	CENCA	NGO
International Biogas and Bioenergy Centre of Competence	IBBK	Research
International Code Council	ICC	Network
International Ecological Engineering Society	IEES	NGO
International Rainwater Harvesting Alliance	IRHA	Multilateral
International Water and Sanitation Centre	IRC	iNGO
International Water Association	IWA	Network
International Water Centre	IWC	Research
International Water Management Institute	IWMI	iNGO
IPStar B.V.	IPStar B.V.	Multilateral
IRIDRA	IRIDRA	Private
Japan International Cooperation Agency	JICA	Gov
Japan Water Forum	JWF	Network
Japanese Association of Drainage and Environment	JADE	iNGO
Jimma University	Jimma	Research
JINJ Ltd.	JINJ	Private
KfW	KfW	Gov
Knoten Weimar	KW	Private
Land and Water Bolivia	LWB	Private
LeAF	LeAF	Private
Local Governance Network	LGNet	Network
Makerere University	Makerere	Research
Millennium Water Alliance	MWA	iNGO
National Institute of Health Islamabad	NIH	Gov
National Institute of Medical Science and Nutrition	INNSZ	Gov
Nature Healing Nature	NHN	iNGO
Network for Water and Sanitation	NETWAS	Network

Network of Environmental Concerns and Solutions	NECOS	NGO
New Directions Foundation	NDF	NGO
NGO Forum for Public Health	NGO-FPH	NGO
Northern Youth Network	NYN	NGO
Norwegian University for Life Sciences UMB	UMB	Research
Oxfam GB	Oxfam	iNGO
Partners in Development	PID	Private
PATH	PATH	iNGO
Peepoople	Peepoople	Private
Plan International	Plan	iNGO
Population Services and Training Center	PSTC	NGO
Practical Action Southern Africa	PASA	iNGO
Programme Solidarite Esu	pS-Eau	iNGO
Public Hygiene Lets Us Stay Human	PHLUSH	NGO
Quicksand	Quicksand	Private
Rebuild Lasting Together	RLT	NGO
Resource Centres on Urban Agriculture & Food Security	RUAF	iNGO
RTI International	RTI	Research
Ruby Cup	Ruby Cup	Private
Rural Africa Water Development Project	RAWDP	NGO
Rwanda Environmental Conservation Organization	RECO	NGO
Safi Sana	Safi Sana	iNGO
Sanergy	Sanergy	Private
SaniTronics International BV	SaniTronics	Private
SaniWater Solutions	SaniWater	Private
Sara Transformacion	Sara	Private
Sardar Vallabhbhai National Institute Of Technology	SV NIT	Research
seecon gmbh	seecon	Private
Sejuti Health and Education Development Foundation	SHEDF	NGO
Separett AB	Separett AB	Private
SES Efficiency	SES Efficiency	Private
SEWAHAR	SEWAHAR	NGO
Sisternet	Sisternet	iNGO
Skat Consulting Ltd.	Skat Consulting	Private
SNV Netherlands Development Organization	NDO	iNGO
Social AID	Social AID	NGO
Society for Community Organization and People's Education	SCOPE	NGO
Society for People's Action in Change and Equity	SPACE	NGO
Stockholm Environment Institute	SEI	Gov
Sulabh International Social Service Organisation	Sulabh	iNGO
SuSanA Secretariat	SuSanA Secretariat	Network
Sustainable Organic Integrated Livelihoods	SOIL	NGO

Sustainable Sanitation Design	SSD	iNGO
Sustainable Water Management Group	SWMG	Research
Swedish International Development Agency	SIDA	Gov
Swedish University of Agricultural Sciences	SUAS	Research
Swedish Water House	SWH	Network
Synergy International	Synergy	Private
Tansworld Publishers Limited	Tansworld	Private
Tanzania Association of Environmental Engineers	TAEE	NGO
Tanzania Water and Sanitation Network	TWSN	NGO
Tearfund	Tearfund	iNGO
Technologies for Economic Development	TED	NGO
Terre Des Hommes	TDH	iNGO
The Institute of Wastewater Management and Water	TUHH	Research
The Network University	TNU	Research
Toilettes Du Monde	TDM	iNGO
Tribhuvan University	Tribhuvan	Research
ttz Bremerhaven	ttz	Research
TU Delft	TU Delft	Research
Udyama	Udyama	NGO
UG EKOPOT	UG EKOPOT	NGO
Umande Trust	Umande	NGO
UN-HABITAT	UN-HABITAT	Multilateral
UNESCO-IHE	UNESCO-IHE	Research
UNICEF	UNICEF	Multilateral
University of Bonn-Center for Development Research	ZEF	Research
University of Essex	UofEssex	Research
University of KwaZulu-Natal	UKZN	Research
University of Sao Paulo	USP	Research
Unnayan Shahojogy Team	UST	NGO
Urban Water Management Sweden AB	UWMS	Private
Vent-Choir	Vent-Choir	NGO
Vrutti Livelihoods Resource Centre	VLRC	Private
WAND Foundation	WAND	NGO
Wash United	Wash United	iNGO
WASTE	WASTE	iNGO
Water and Sanitation for Africa	WSA	Multilateral
Water for People	Water for People	iNGO
Water Research Commission	WRC	Research
Water, Engineering and Development Centre	WEDC	Research
WaterAid	WaterAid	iNGO
Watershed Management Group	WMG	iNGO
Welthungerhilfe	Welthungerhilfe	iNGO
Wetlands Work!	WW!	Research

Wherever The Need	WTN	NGO
Women for Sustainable Development of Moldova	WISDOM	NGO
Women for Water Partnership	WfWP	NGO
Women in Europe for a Common Future	WECF	NGO
Woo Woo Waterless Toilets	WWWT	Private
Work for a Better Bangladesh	WBB	NGO
World Bank: Water and Sanitation Program	WSP	Multilateral
World Toilet Organization	WTO	NGO
WorldStove	WorldStove	Private
x-runner Venture	x-runner	Private
Xavier University	Xavier	Research