Transition through Capacity Building

Trainings achieve knowledge transfer and contribute to the macro level outreach of capacity building.

Authors: Antje Sandmann, Jan Knappe, Sophia Bremer, Susmita Sinha

Abstract

In the process of scaling up decentralised sanitation solutions, training programmes that aim at technical knowledge transfer are crucial. In order to promote necessary capacities that can lead to transitional impacts, i.e. macro level changes, impact variables have to be identified and monitored regularly. The impact of CDD Society's trainings on knowledge, implementation and dissemination capacity of training participants, is assessed through the comparison of desired and actual outcomes of trainings on individual and organisational level. Implications for transitional impacts of trainings are derived from feedback analysis and survey of former training participants. The results show that the trainings achieve a knowledge transfer and that the target group is actively disseminating the decentralised approach. The results reveal that enforced use of structured, targeted information and networking through innovative communication channels as well as new approaches for public stakeholder involvement can improve the macro level outreach of capacity building.

Introduction

Strong population growth and migration from rural to urban areas lead to increased solid and liquid waste production. Since centralised sanitation infrastructure cannot cater to the increased demand for sanitation solutions in urban areas, more than 2.5 billion people worldwide lack access to sanitation. The sanitation coverage in South Asia has increased by only 17 percent in the last 20 years with basically no effect on marginalised groups like urban poor (WHO/UNICEF 2012).

To satisfy the urban demand for sanitation CDD Society, the Consortium for DEWATS Dissemination Society, conducts technical trainings on decentralised wastewater treatment systems (DEWATS). The aim of this capacity building programme is to scale up decentralised basic needs infrastructure for improved access to sanitation of communities, institutions, individual households and enterprises (Sinha and Kraemer, 2010). The target group of this capacity building programme is service providers in the sanitation delivery chain. The capacities that are promoted in the trainings are knowledge on wastewater treatment, the ability to implement sanitation projects and spread the decentralised approach.

Loorbach and Rotmans (2004) state that the dissemination of technologies depends on stakeholder's involvement in transmitting qualitative innovation. Adopters of technologies and approaches achieve organisational or environmental spill over which leads to 'transition' when causing changes in a societal subsystem (Loorbach and Rotmans, 2004; Heeks and Molla 2009).

In the following it is assumed that the success of technical trainings is a condition for transitional impacts, for example improved sanitation coverage. Assumptions for the success of trainings, derived from Kirkpatrick's model of training evaluation (Kirckpatrick and Kayser Kirkpatrick, 2009), are that knowledge is transferred successfully, trainees implement projects on their own and disseminate training knowledge in their sector and field of work.

Key messages:

- Structured approach to capacity building programme
- Impact variables assessed indicate transitional impacts
- Comparison of desired and actual outcomes of trainings on individual and organisation level show positive impact of knowledge transfer
- Enforced use of structured, targeted information and networking for stakeholder involvement does result in macro level outreach of capacity building

Table 1. Trainings included in feedback evaluation

Year/ Month	Training	N participants
2009/ August	DEWATS Engineers	17
2009/ September	DEWATS Engineers	15
2009/ December	DEWATS Engineers	16
2009/ December	Site Supervisors	8
2010/ January	DEWATS Project Management	7
2010/ March	Operation and Maintenance of DEWATS*	21
2010/ April	Operation and Maintenance of DEWATS*	22
2010/ May	DEWATS Engineers	9
2010/ June	Site Supervisors	8
2010/ August	Periodical Maintenance of DEWATS*	7
2010/ October	DEWATS Engineers	19
2010/ November	DEWATS Engineers	12
2011/ February	City Sanitation Planning	20
2011/ May	DEWATS Engineers	11
2011/ December	DEWATS Engineers	7
2012/ April	DEWATS Engineers	14
2012/ May	City Sanitation Planning	14
2009 - 2012	**Total = 17**	**Total = 227**

Methods

Sample

The impact assessment refers to 17 training programmes (Table 1) that were conducted from 2009 to 2012 with a total number of 227 participants. All trainings conveyed knowledge and skills for the implementation of decentralised sanitation solutions such as project management, wastewater treatment and community based sanitation. Out of the total number of trainees from 2009 to 2012 a sample of 17 participants has taken part in the conducted survey.

Data Collection

The data was gathered in a survey and through feedback evaluation.

Feedback evaluation

The feedback of participants was captured through standardised paper based questionnaires in every training programme from 2009 to 2012. It allows comparable evaluation of the training perception and self assessments of the 227 trainees.

Survey

CDD Society has implemented a tracking system for monitoring trainees' sector experience after having attended specific programmes. Therefore once a year trainees that have agreed to be monitored are invited to take part in a survey. Trainees were contacted through emails, meetings and telephonic interviews. Since participants are tracked earliest one year after having attended the programme, trainings conducted after June 2012 are not included in the sample.

Research Design

The training impact, i.e. the comparison of desired and actual outcomes, is assessed in a multi-dimensional analysis through the triangulation of survey data and feedback evaluation. The feedback evaluation captures trainees' perception of the training at the point of time of training attendance (t1). The survey assesses post training changes in the targeted capacities, e.g. manner of working, project realisations or other engagement in the sanitation sector. This is assumed to reveal earliest one year after the training has been attended; hence the point of time of survey is defined as $t2 = t1 + n$, $n \geq 1$, where n signifies the number of years after training attendance.

Concept and Indicators

Perceived knowledge impact

Empowerment for the implementation of sanitation projects is based on thorough transfer of knowledge and skill. Therefore the desired outcomes on the individual level are achievement of knowledge transfer and satisfaction with the trainings' applicability and content. Individual knowledge and skill transfer were assessed by the evaluation of the feedback given by participants during the training programmes. The perceived knowledge impact is represented with hypothesis H1: Trainings lead to knowledge transfer.

Implementation impact

The desired capacity which is assessed on this level is the conversion rate of trainees. Conversion is indicated by the number of DEWATS implemented, number of trainings conducted by former trainees and sanitation projects implemented by trainees. Based on these sub categories, desired and actual capacities are compared to assess the implementation impact in hypothesis H2: Trainees implement projects on their own.

Dissemination impact

The dissemination of sanitation solutions, as pursued by CDD Society, through knowledge transfer is of major importance to achieve a macro level impact. The dissemination impact of trainings is assessed through a score of respondents' level of communication, distance, equivocality and motivation regarding the application

Table 2. Impact indicators and sub categories

Categories	Sub categories	Weighting
I) Perceived knowledge impact	Perceived knowledge	0.5
	Perceived applicability of content	0.25
	Perceived satisfaction with content	0.25
II) Implementation impact	DEWATS for small& medium enterprises	0.25
	DEWATS for communities	0.25
	Other sanitation projects	0.25
	Number of people trained by trainees	0.25
III) Dissemination impact	Communication	0.25
	Motivation	0.25
	Distance	0.25
	Equivocality	0.25

of imparted technological knowledge. This approach is based on the knowledge transfer grid, given by Sung and Gibson, who state that sharing of experience is essential for the implementation of new technological approaches: "[...] knowledge transfer requires collaborative activity between two or more individuals or functional units […]"(Sung and Gibson 2000).

Communication refers to the degree to which task-relevant information is gathered and conveyed, indicated by the number of information sources consumed and number of people trained by CDD Society's former training participants. Distance covers physical and cultural proximity in the process of knowledge transfer and application. It is indicated by the location of the trainees as well as their respective locality of action. Furthermore the influence of cultural proximity or distance on project implementations is tested. Equivocality signifies the extent to which knowledge and technology are applicable for trainees. It is indicated by trainees' contribution to project implementations. Personal motivation is regarded as a factor that indicates how important transferred knowledge and technology are valued by the trainees. The dissemination impact of trainings is assessed with hypothesis H3: Trainees disseminate training knowledge in their sector and field of work.

The following section describes how the hypothetical assumptions on training success are used to reveal potential transitional impacts.

Operationalisation

A scoring scheme is applied to compare the data from survey and feedback. The score sums indicators for the assumptions in hypothesis 1, 2 and 3 as categories and sub categories (Table 2). The weighting of categories is based on their presumed share in creating an impact on the targeted training outcomes. The score quantifies the gathered data on a scale from 1 to 10. The higher the scores in each category the more probable is a transitional impact of the trainings.

Data Analysis

The sub category scores are aggregated to three sum scores which are evaluated according to their difference from the maximal sum. The values of each sub category are analysed through summary statistics. For the evaluation of hypothesis 1 to 3 a two-tailed Wilcoxon Signed-Rank test is applied. This test compares the median values of ordinal scaled, independent and symmetrical samples for which normal distribution cannot be assumed as in case of the given sample (Siegel, 1957).

Results

Table 3 displays the results of the nonparametric test. For H1, H2 and H3 the W-Value is smaller than the obtained critical value of W, indicating that the difference between the compared median values is unlikely to occur by chance at a significance level of $p \leq 0.05$.

Knowledge impact

This first category assesses the transfer of subject knowledge in trainings. The sample encompasses 14 of the trainings listed in table 1 with a total number of 177 participants. Signified (*) trainings showed non-comparable self-assessment procedures and were excluded. The micro level impact is assessed according to the sub categories given in table 4.

The sub category 'perceived knowledge' is a comparison of participants' individual subject knowledge before and after each training session. The average state of perceived subject knowledge before training was given

Table 3. Results of Wilcoxon Signed- Rank Test

Hypothesis	W-value	Sample size (N)	Critical value of W	Significance Level
H1	0	13	17	$p \leq 0.05$
H2	0	12	13	$p \leq 0.05$
H3	0	17	34	$p \leq 0.05$

Table 4. Sub categories of knowledge impact

Category	Sub categories	Average	Weighting	Score
Knowledge impact	Perceived knowledge increase	26 %	0.5	1.3
	Perceived applicability of content	86 %	0.25	2.3
	Perceived satisfaction with content	91 %	0.25	2.1
				Impact Score 5.7

as 56% of the maximum. After having attended the training, participants perceive their average knowledge increased by 26 %, which is nearly 60 % of the highest possible gain.

The training content satisfies trainees' expectations with a rating close to the maximum, by average value of 91 % (number of participants= 227, number of trainings = 17). The content is perceived as applicable by 86 % of 227 trainees, who showed almost full accordance to statements that indicate confidence to apply the skills and knowledge in their field of work. The results in table 4 support H1.

Implementation Impact

In total, 33 sanitation related initiatives, such as giving trainings and implementing projects, have been realised by 17 respondents. The score of implementation capacity weights the implementation of wastewater treatment and other sanitation related projects with 75 %. The conduct of trainings, given by number of people trained by trainees, is weighted by 25 %. The majority of respondents (12) have an implementation score between 0 and 2, meaning that both no projects have been realised and no training conducted or one of both has been realised. 4 respondents, the minority, score between 4 and 5, indicating that some projects have been implemented. The total score value in the level of implementation is 4.31 as given in Table 5, supports hypothesis H2: trainees implement projects on their own.

Dissemination impact

Communication. The average participant scores 4.7 for communication. The 10 % of participants with the highest value score between 6.8 and 7.9. The lowest 10 % have a score of 2. The score of trainings' communication impact related to a maximum of 10 is 1.9 after weighting (Table 6).

Distance. Table 7 shows the scores in the category 'Distance'. With respect to the locality of a trainee and his field of action or implementation an average score of 4.4 is obtained. Cultural constraints revealed to have no effect according to respondents. In the sample 9 respondents score 5.3 points indicating that they were trained international and implemented projects as well as conducted trainings in their place of residence (other than India). Half of the trainees (8) score 3.9 or below, i.e. reside and were trained in India and do not implement projects. The summed impact score after weighting is 4.4.

Table 5. Implementation impact

Category	Sub category	Total conversion	Average	Weighting	Score
Implementation	DEWATS SME	18	0.41	0.25	1.03
Impact	DEWATS CBS	2	0.05	0.25	0.15
	Other sanitation projects	7	0.3	0.25	0.88
	People trained by trainees	330	0.9	0.25	2.25
					Impact score 4.31

Table 6. Average communication scoring

Category	Sub category	Average	Weighting	Score
Communication	People trained by trainees	0.9	0.25	0.23
	Information sources	5.6	0.25	1.4
	Networking	0.7	0.25	0.19
	Exchange on projects	0.2	0.25	0.06
				Impact score 1.9

Table 7: Distance score

Category	Sub category	Average	Weighting	Score
Distance	Cultural constraint	0	0.5	0.0
	Localisation	1.76	0.5	4.4
				Impact score 4.4

Table 8: Equivocality score

Category	Sub category	Average	Weighting	Score
Equivocality	Knowledge application	0.67	0.5	3.4
	Project implementation	0.71	0.5	3.5
			Impact score	**6.9**

Table 9. Motivation score

Category	Sub category	Average	Weighting	Score
Motivation	Training conducted	0.35	0.5	1.8
	Project implementation	0.71	0.5	3.5
			Impact score	**5.3**

Equivocality. The score on this level is based on an aggregation of the variety of knowledge disclosure, application, and project implementation in the sanitation sector through former trainees. Respondents score 10 if they have implemented at least one sanitation related project and have contributed to this in multiple ways (design, construction, community mobilisation, monitoring and evaluation or concept). The average score of the participants is 6.9. The majority of respondents (76 %) shows a score value of 5 or higher. Table 8 gives an overview of the sub score values for equivocality.

Personal motivation. Personal motivation is a score that adds up 1 (= "yes") and 0 (= "no") values of the sub categories project implementation and training conduct. A maximum score of 10 indicates that both project and training have been realised by respondents, whereas 5 represents one of them and 0 none. The average score in this sub category is 5.3 (table 9). A motivation score of 5 or higher is shown by 70 % of the sample.

Through the sub scores communication, distance, equivocality and motivation an average dissemination score of 5 is obtained. Since this score is > 0, hypothesis H3 is supported.

Discussion

Perceived knowledge impact

The results support hypothesis H1, the trainings lead to transfer of knowledge. A score of 5.7 out of 10 reveals that the knowledge transfer regarding project management, design, construction, operation, maintenance and planning of decentralised sanitation solutions is successful. Even though the results might be biased due to social desirability effects during the feedback sessions, a knowledge impact through the trainings can be assumed as the perceived individual knowledge has not decreased but increased after training attendance. The highest possible value of knowledge increase was identified as 44 % out of which the participants from 2009 to 2012 have reached 26 %. The exposure to training content that is valued as applicable according to expectations and work field requirements of the trainees supports the assumption that the training has an impact on the individual knowledge.

Implementation impact

The results support hypothesis H2, trainees implement projects on their own. The combined score for trainings conducted and projects implemented is a value of 4.31. It indicates that former trainees have initiated, implemented or contributed to sanitation related projects. An average of 19 persons has been trained by each of the 17 respondents. Especially the number of people trained by former training participants is important with regards to achieving a transitional impact. These results might be biased due to varying implementation periods of different project types. The average implementation score indicates that the actual conversion is low. Reasons for non implementation of projects, as reported by 9 respondents, are financial or institutional constraints. The sample ratio of DEWATS implementation for small and medium sized enterprises and community based DEWATS reveals a trend towards commercialised or private rather than public projects. This trend is also mirrored in the funding hence more than half of the 20 DEWATS projects are financed by private, four by public–private and two by public sources. This result indicates that implementation could be linked to the capacity of tapping public funds as public sector involvement in decentralised sanitation infrastructure projects, for example through consultancy given by trainees, is less frequent.

Dissemination impact

The results support hypothesis H3, trainees disseminate training knowledge in their sector and field of work. Spill over of technical approaches imparted in trainings is likely since former training participants proactively diffuse their knowledge.

The average scores in the category 'Distance' suggest that dissemination across countries is possible and that cultural constraints have rather low influence on the dissemination. The equivocality scoring reveals high involvement of former trainees in the sanitation provision chain either through technical, social or academic contribution. The majority of respondents

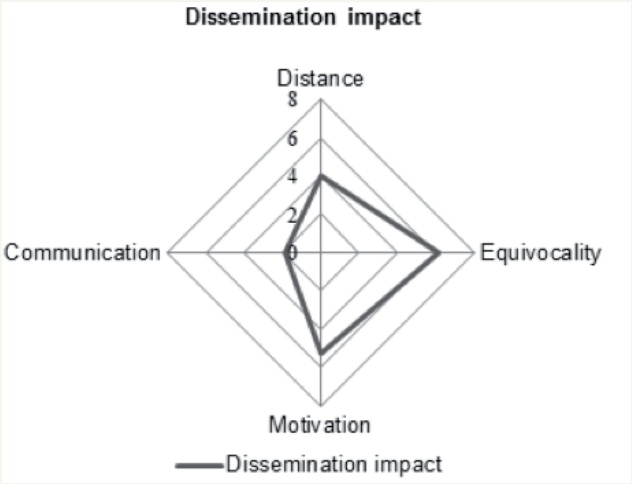

Figure 1: Actual distribution of dissemination capacities

show low or medium ranked scores for communication (1.9) and motivation (5.3), indicating low efforts for information gathering, networking or involvement in information campaigns and mobilisation.

The comparison of optimum and actual distributions of the dissemination components that are targeted in training programmes (Figure 1) shows an important learning. Even though the trainings achieve a knowledge transfer, the training impact on communication and motivation capacities of participants is still low. As the importance attributed to technical knowhow is crucial for project realisations, the dissemination impact could be increased through adjustment of imparted technical trainings to interests and local conditions of trainees. One pillar for improved dissemination could be more emphasis on communication in the DEWATS context in order to facilitate marketing and clients' choice.

Conclusion

The impact assessment of CDD Society's training programmes from 2009 to 2012 leads to the conclusion that technical trainings have an impact on knowledge, implementation and dissemination capacity of trainees who are engaged in providing sanitation solutions. The tendency towards private or public-private sector involvement can be interpreted as positive in the commercial scaling up of decentralised sanitation solutions, like DEWATS. On the other hand the revealed low public sector involvement and turnover in sanitation projects, especially in combination with motivational or communication deficits refute a transitional impact. Adjusted training designs with emphasis on new channels of communication and on local conditions of participants could increase the efficiency of public sector involvement and enhance the transitional impact of training programmes.

References

Heeks, R., Molla, A. (2009): Compendium on Impact Assessment of ICT-for-Development Projects. International Development Research Centre, USA, pp. 2-5.

Kirkpatrick, J., Kayser Kirkpatrick, W. (2009): The Kirkpatrick Four Levels™: A Fresh Look After 50 Years 1959–2009. Kirkpatrick Partners, LLC, (http://www.kirkpatrickpartners.com/Portals/0/Resources/Kirkpatrick%20Four%20Levels%20white%20paper.pdf, assessed 7 July 2014)

Loorbach, D., Rotmans, J. (2004): Managing Transitions for Sustainable Development. In: Olsthoorn X., Wieczorek A.J. (Eds.): Understanding Industrial Transformation, Environment & Policy Volume 44, Springer Netherlands, pp.187-206.

Siegel, S. (1957): Nonparametric Statistics. The American Statistician 11(3), 13-19.

Sinha, S., Kraemer, P. (2010): Capacity Building - A tool for Up-scaling Decentralised Sanitation Infrastructure Provision. Water Practice & Technology, doi:10.2166/wpt.2010.116 (http://www.iwaponline.com/wpt/005/0116/0050116.pdf, assessed 7 July 2014.

Sung, T.K., Gibson, D.V. (2000): Knowledge and Technology Transfer: Levels and Key Factors. Proceedings of 4th International Conference on Technology Policy and Innovation 2000, pp. 4.4.1–4.4.9.

WHO/UNICEF (2012): Joint Monitoring Programme for Water Supply and Sanitation. Progress on Drinking Water and Sanitation: 2012 Update. UNICEF and World Health Organization, New York, USA.

Names: Antje Sandmann
Organisation: Consortium for DEWATS Dissemination Society
Town, Country: Kengeri, India

Names: Jan Knappe
Organisation: Consortium for DEWATS Dissemination Society
Town, Country: Kengeri, India

Names: Sophia Bremer
Organisation: Consortium for DEWATS Dissemination Society
Town, Country: Kengeri, India

Names: Susmita Sinha
Organisation: Consortium for DEWATS Dissemination Society
Town, Country: Kengeri, India
eMail: susmita.s@cddindia.org