

## Training Report



### Orientation Seminar on Disaster Resilient Construction Technologies for Registered Architects and Engineers

20th November 2019, Thiruvananthapuram, Kerala  
22nd November 2019, Kozhikode, Kerala

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## **1. BACKGROUND**

According to the Post Disaster Needs Assessment (PDNA) of the Kerala floods 2018, the housing sector suffered an overall loss of Rs. 5,443 Crores. Although rebuilding the damaged houses poses a huge challenge, it also gives the opportunity to build back better. This requires reaching out to multiple stakeholders and orienting them on the need to adopt disaster resilient construction practices.

It was identified that Registered Architects and Engineers who are signatories in building permit procedures can play an important role in mainstreaming DRR features in the construction sector. Moreover, there appears to be a dearth of professionals in the state who are well versed in disaster resilient construction. Therefore, sensitizing practicing Engineers and Architects on hazard resilient construction principles, guidelines, and techniques is vital in the recovery process and needs orientation programmes to be conducted as the first step towards long term resilience.

It is against this backdrop that UNDP India conducted a one-day orientation seminar each in the districts of Thiruvananthapuram and Kozhikode, on Disaster Resilient Construction Technologies for Registered Engineers and Architects of Kerala. The report details out the programmes conducted in both the districts.

## **2. OBJECTIVE OF THE TRAINING**

The training had 2 main objectives:

1. To familiarize Engineers and Architects on multi-hazard resilient construction techniques.
2. To share good construction practices of Kerala and have common understanding on disaster resilient features.

## **3. ABOUT THE TRAINING**

The one-day orientation programme was designed combining technical elements of construction practices which helps Engineers and Architects to understand basic principles of hazard resilient construction practices relevant in the context of Kerala.

## **4. PARTICIPANTS' PROFILE**

The training was attended by Architects and Engineers in both districts. A total of 12 participants (5 females and 7 males), including 2 PWD Architects, attended the workshop in Thiruvananthapuram. In Kozhikode, 13 participants (3 females and 10 males), including 2 Government Engineers, attended the workshop. The detailed list of participants has been attached in Section 9 of the document.

## 5. TRAINING SCHEDULE

Session Number	Timing	Name of the Session
1.1	1000-1030	Course Introduction
	<b>1030-1100</b>	<b>Tea Break</b>
1.2	1100-1200	Need for Incorporating Disaster Resilient Features
1.3	1200-1225	NDMA Guidelines and Bylaws for Flood-prone Areas
1.4	1225-1330	Principles of Hazard Resilient Construction
	<b>1330-1415</b>	<b>Lunch Break</b>
1.5	1415-1445	Hazard Resilient Design Guidelines (Features for House Size and Configuration etc.)
1.6	1445-1530	Hazard Resilient Features for Different Parts of the Building (Structural and Non-Structural)
	<b>1530-1545</b>	<b>Tea Break</b>
1.7	1545-1645	Case Studies/ Best Practices/ Experience Sharing on Disaster Resilient Construction
1.8	1645-1715	Course Evaluation and Conclusion

## 6. BRIEF OF PROCEEDINGS

### Welcome, Introductions and Programme Overview

The programme started with welcome of participants by RedR facilitator. For their introduction, participants were asked to draw something on flash cards which revealed their personalities or the philosophies they follow, or simply the meaning of their names. The facilitator then briefed participants about the programme overview and the subjects that would be covered.



### Need for Incorporating Disaster Resilient Features

The main objective of the session was to build a common understanding on various hazards and their impacts on building components. However, as it was important to have a common understanding on various DRR terms among participants, the session was initiated with discussion on the terms Disaster and Hazard.

Participants were asked if they knew the difference between the 2 terms. Building on the different perceptions held by participants on these terms, the facilitator emphasized on the need to have a common understanding of these terms in context to the training course. He then explained the definitions of these terms and participants illustrated examples of various hazards.

The terms like Risk, Vulnerability and Capacity were also discussed with participants for them to get a clear understanding of the concepts. The interrelation between these terms was explained by the formula

$$\text{Risk} = \text{Hazard} \times \text{Vulnerability} / \text{Capacity}$$

Participants were then asked to list various hazards relevant in their work area which are most frequent and damaging.



Then, participants were shown a series of photographs of damage induced by floods and landslides in Kerala. Participants were asked to identify the damages, following which the facilitator discussed the forces acting on buildings in various hazards like earthquake, flood, cyclone, landslide etc., and how it affects the behaviour of a structure. The need for incorporating hazard resilient features to save lives and reduce damage to assets was emphasised upon.

### **Principles of Hazard Resilient Construction**

This session began with showing a short film called ‘The Shelter Effect’ and discussing the importance of shelter in various facets of life. Then participants were asked to work in groups to enlist the various types of potential damages to building elements in various hazards. Once the damages were listed, the facilitator introduced participants to the simple method of categorising the mitigation measures or hazard resilient features in terms of ABCDE- i.e. Anchorage, Bracing, Continuity, Ductility and Enhancement. It was explained to them that this categorisation is only for easy recalling when the participants go on to train others. Then, the details for each term was explained as follows:



a) **Anchorage**-Participants were introduced to the concept and functioning of an anchor and how this helps building components in times of severe forces acting on them during hazards. Plastic straw models were used to demonstrate effectiveness of a good anchor in foundation. Need of anchorage for roof was also discussed.

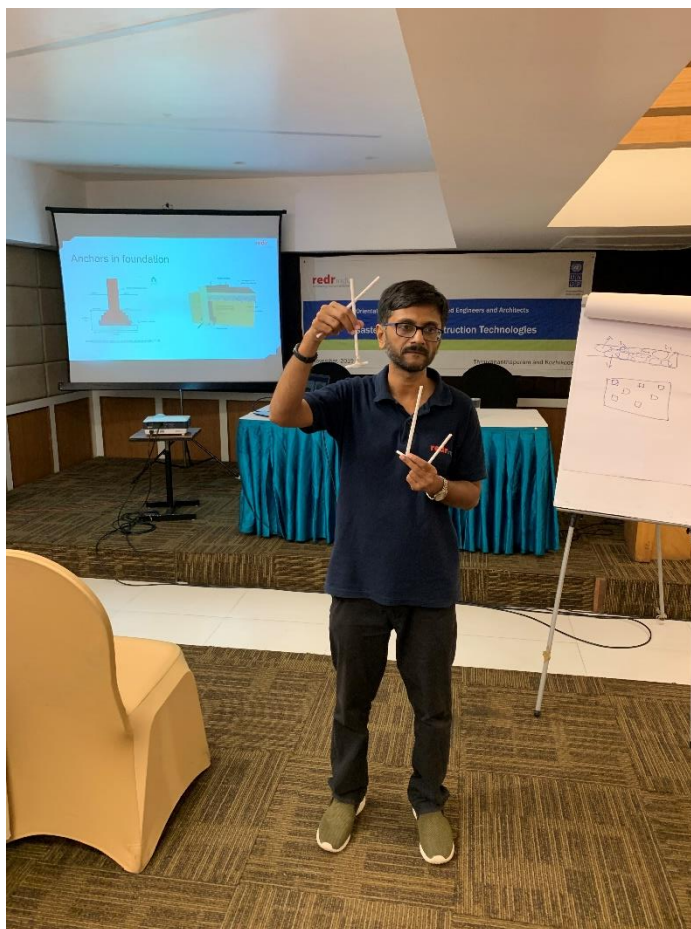
b) **Bracing**- The facilitator explained the function of bracing, and the need for bracing in a building as a hazard resilient feature. Participants were given plastic straws to make a



frame with bracings. Various details of good bracing were discussed and demonstrated using the frames made by participants and showing photographs.

c) **Continuity**-The importance of connection and continuity of building frame was discussed with participants at length. Vulnerability of connection in times of hazard forces were also discussed and some of the common damages of corners and connections were shown to participants. The ways to strengthen and secure connections were also discussed.

d) **Ductility**-The facilitator explained the difference between elasticity and ductility, and the importance of this property of a material was discussed. The emphasis was laid upon how ductility of frame can save lives during hazards.



After discussing ABCD as principles of hazard resilient practices, the participants were asked to refer to the list of damages they had prepared earlier on in the session. They were asked to identify damages that may be avoided or mitigated using this ABCD formula. Participants acknowledged that most of the structural damages could be addressed by applying these principles. Only the damages induced by external factors such as site protection needed other measures. The facilitator then explained that these factors can be taken care using the fifth principle of **Enhancement**.

### **Hazard Resilient Design Guidelines (Building Orientation)**

This session dealt in orientation of building, shape, size, recommendations on span lengths, height of walls, location and dimensions of verandah, openings etc., all of which affect the behaviour of structure in times of hazards. The site specific protection measures such as drainage, retention walls, access to site, and adding disabled-friendly features were discussed using photographs and sketches.

### **NDMA Guidelines for Flood-prone Areas**

In this session, guidelines given by NDMA for flood prone areas and byelaws that govern and regulate the construction activities and development in flood prone areas were discussed.

### **Experience Sharing on Different Technologies and Materials**

In the final session, participants were asked to share their experiences and projects that dealt with alternative technologies, and good practices that are relevant for hazard resilient construction. In Thiruvananthapuram, cases of good practices were shown and practical challenges to adapt alternative technologies and materials were discussed. In Kozhikode, an Engineer shared his project that dealt with detailed design and construction of flood resistant houses in Nilambur, Malappuram district.

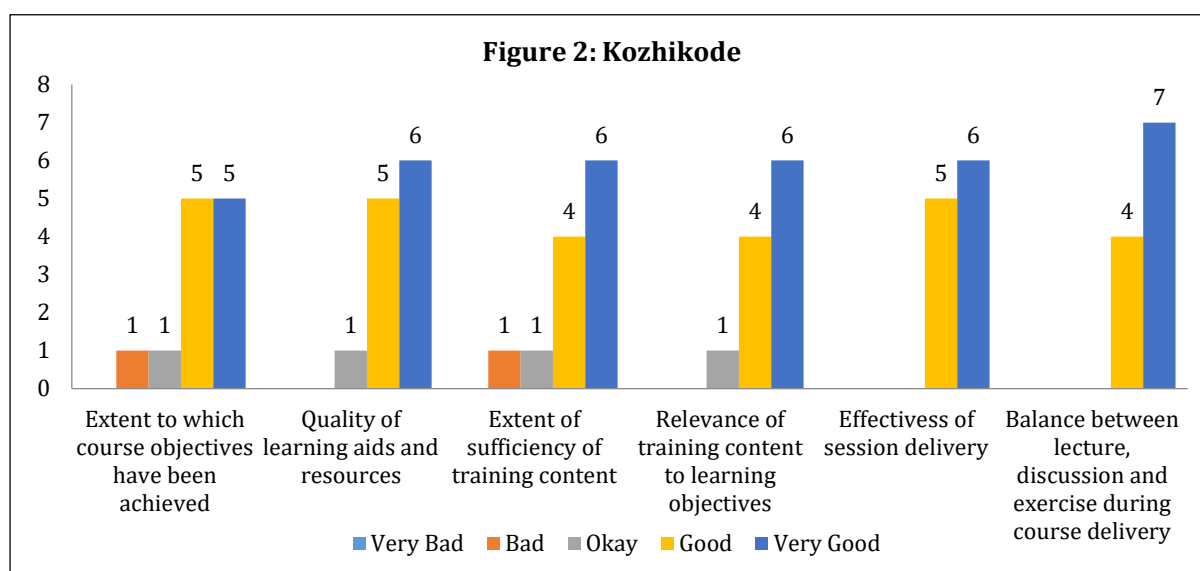
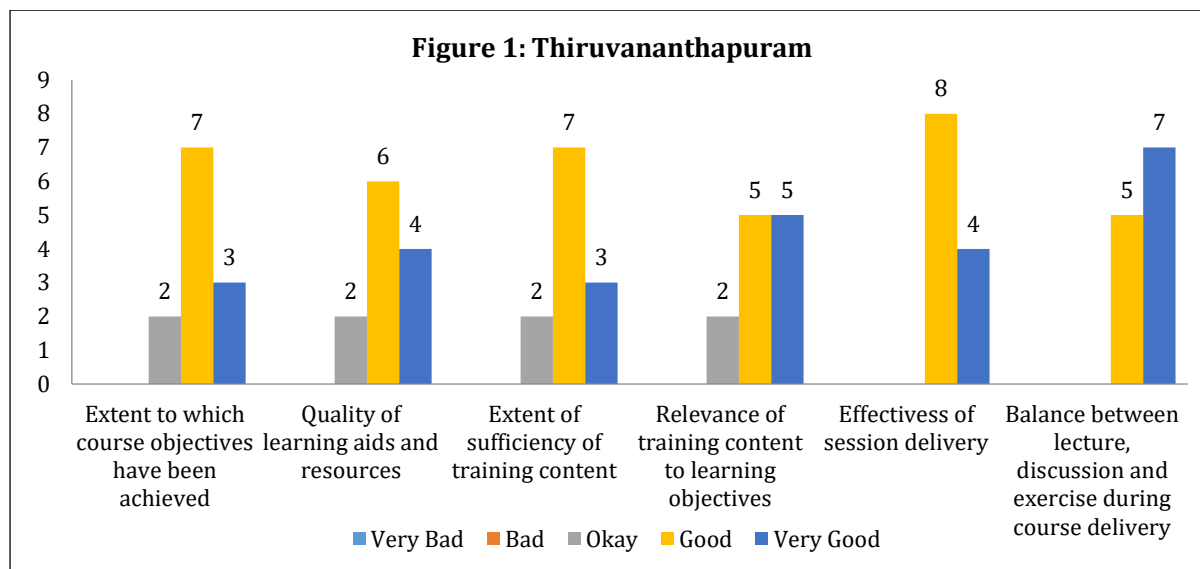


The programme was concluded with participants filling up RedR India's standard Training and Trainer Evaluation Forms, distribution of certificates and vote of thanks.



## 7. TRAINING EVALUATION

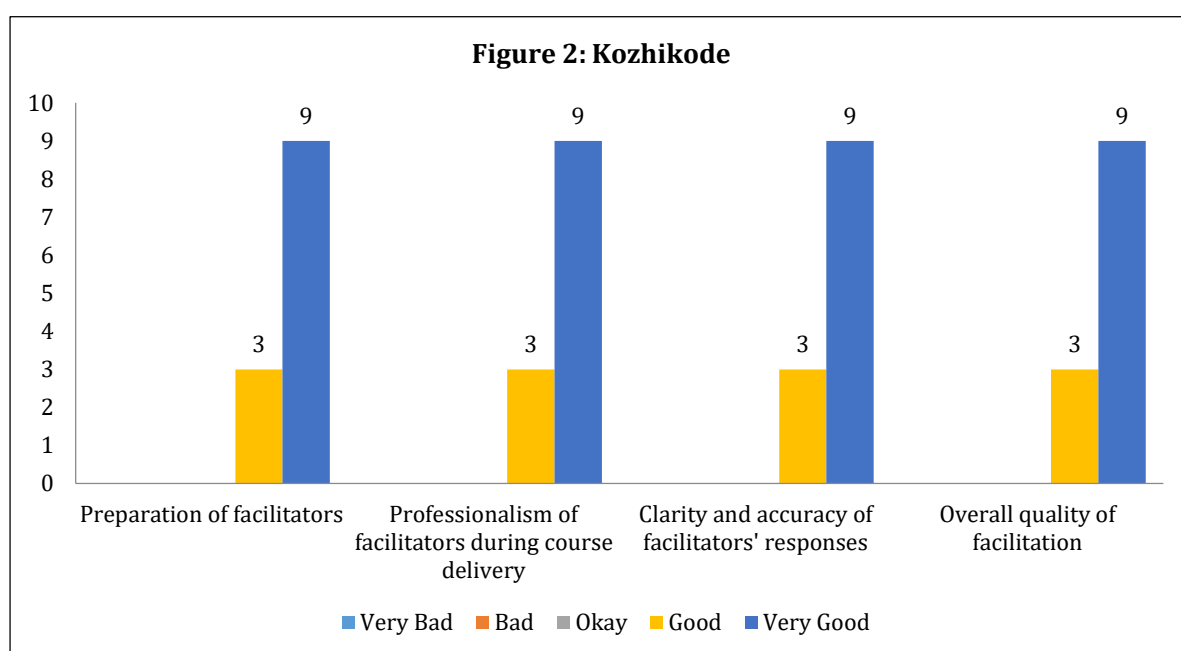
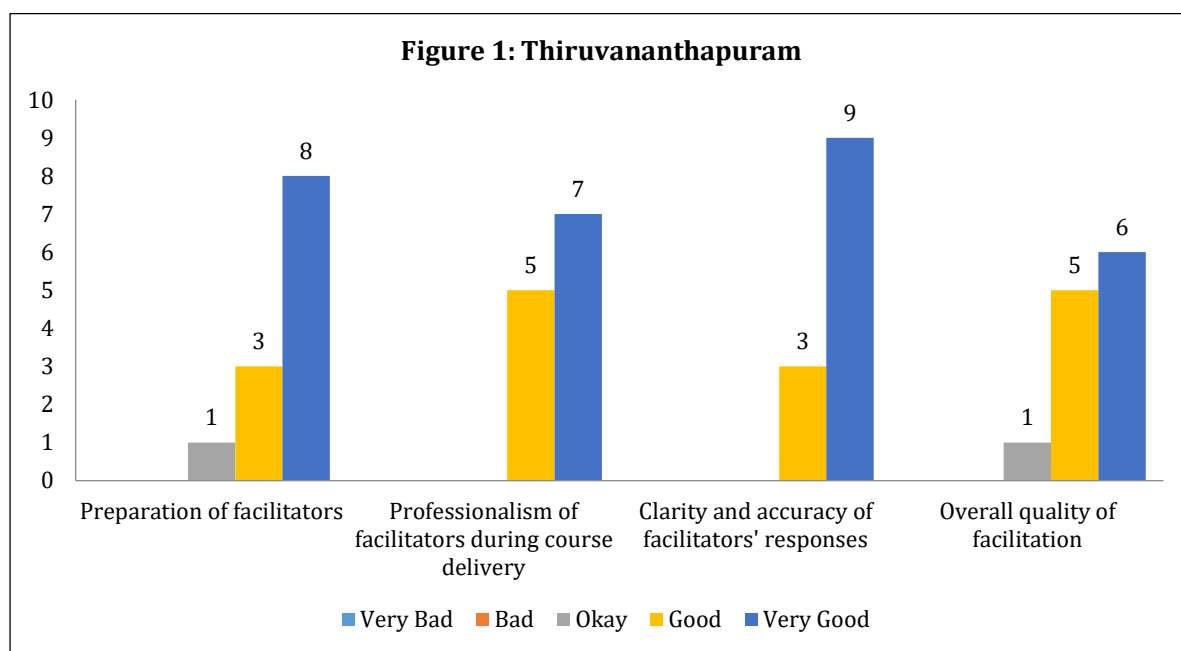
### 1. Evaluation of Course Objectives and Delivery



Regarding the extent of achievement of course objectives, 7 participants (58%) in Thiruvananthapuram found the same to be good, and 3 (25%) rated the same very good, while 5 participants (38%) in Kozhikode rated the same good and 5 (38%) others, very good. 2 participants in Thiruvananthapuram and 1 participant in Kozhikode rated this as okay.

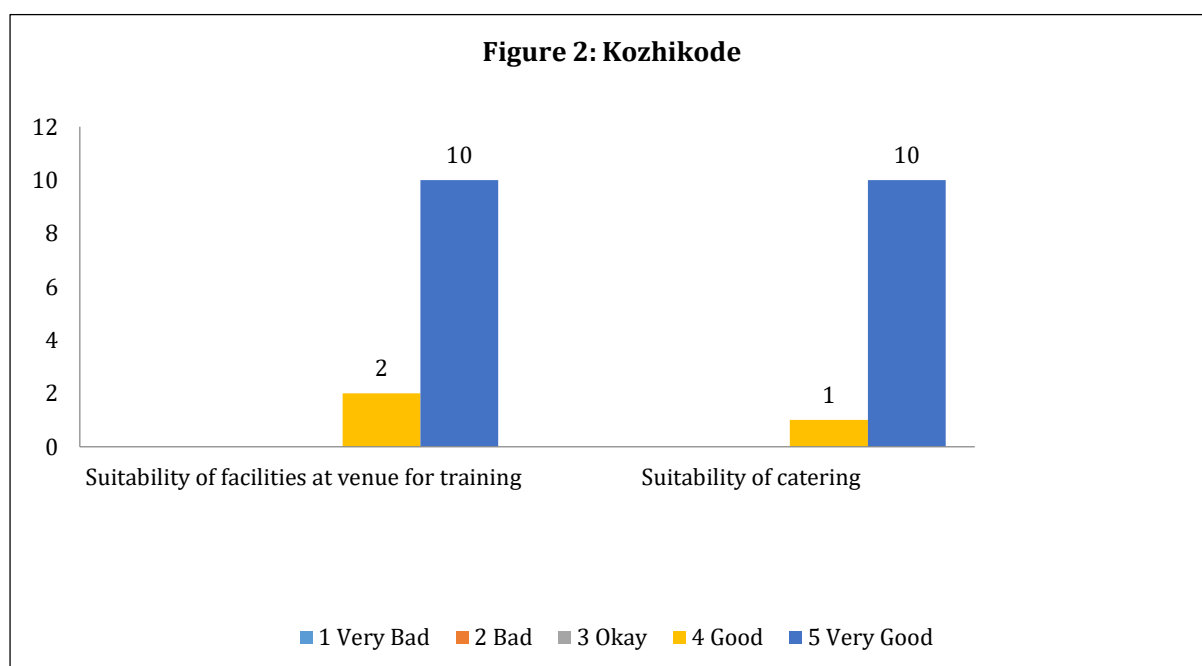
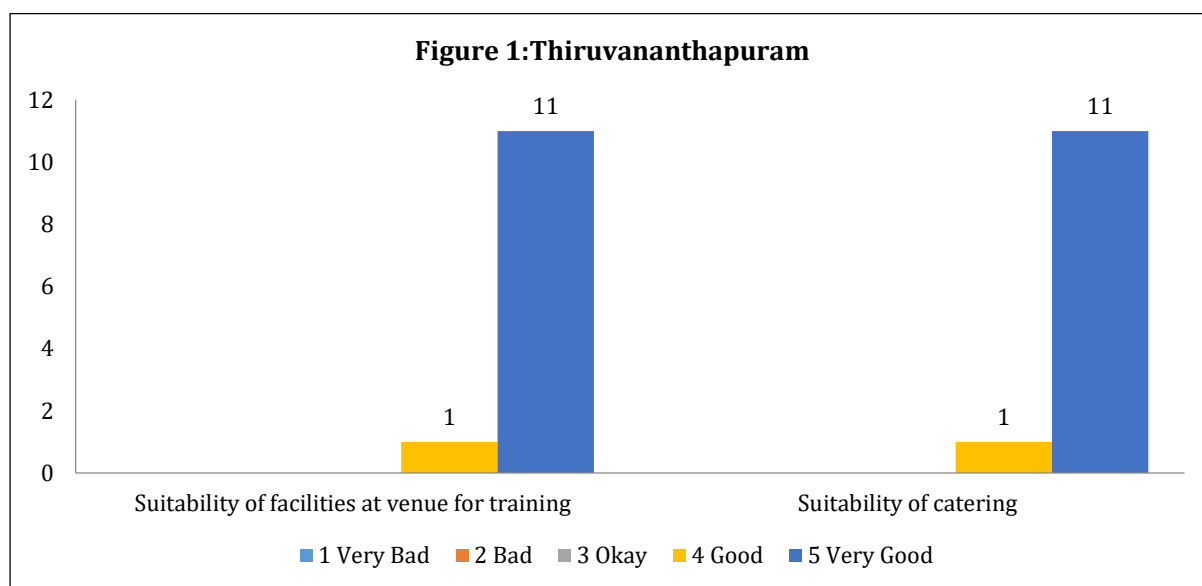
From the above graphs, it is also evident that 5 participants (42%) each in Thiruvananthapuram found the relevance of training content to learning objectives to be good and very good, while 4 participants (31%) rated the same as good in Kozhikode, and 6 others (46%) evaluated it very good. 2 participants in Thiruvananthapuram and 1 participant in Kozhikode rated this as okay.

## 2. Evaluation of Facilitator



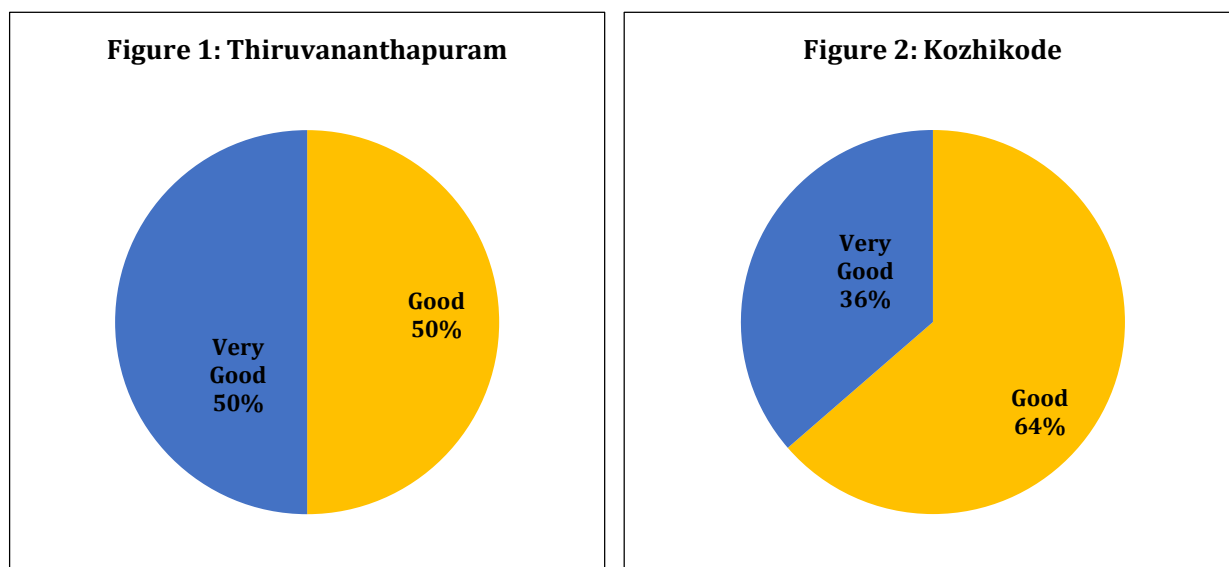
As can be seen above, the clarity and accuracy of facilitator's responses to participants' queries was rated good by 3 participants (25% in Thiruvananthapuram and 23% in Kozhikode), and very good by 9 participants (75% in Thiruvananthapuram and 69% in Kozhikode) each in both districts. The overall quality of facilitation was also well appreciated in both districts, with 5 participants (42%) in Thiruvananthapuram and 3 participants (23%) in Kozhikode rating it good, and 6 participants (50%) in Thiruvananthapuram and 9 participants (69%) in Kozhikode rating the same very good.

### 3. Training Administration and Venue



Regarding the suitability of training facilities and catering at the venue, 11 participants (92%) in Thiruvananthapuram found it be very good, while 1 (8%) felt it was good. 10 participants (77%) in Kozhikode gave both the suitability of training facilities and suitability of catering a very good rating, while 2 participants (15%) rated the suitability of facilities good and 1 participant (8%) rated the suitability of catering good.

#### 4. Overall Course Rating



In Thiruvananthapuram, 50% participants gave the workshop an overall rating of good and 50% gave it a very good rating. While 64% participants gave the workshop an overall rating of good, 36% rated the same very good, in Kozhikode.

#### Qualitative Feedback from Participants in Thiruvananthapuram

1. Fun and interactive training sessions.
2. Good time management.
3. Satisfactory facilitation skills.
4. Received good insights on disaster mitigation in buildings.
5. Diagrammatic representation and illustrations very good.
6. Did not touch upon construction practices in Kerala context.
7. Would be good to have more Resource Persons who are practicing persons in these technologies.
8. Would be good to add examples of regional level implementation statistics of different states.
9. Would be good to have a week long program with field visit.
10. Would be good to have more case examples shared to understand the practical aspects better.
11. Would be good to add more examples of disaster resilient construction practices.
12. The order of sessions could have been more organized.
13. Would be good to have a training with hands-on sessions on disaster resilient construction techniques, even if it is just on brick laying and site preparation.
14. Would be good to have more information on technical details.

#### Qualitative Feedback from Participants in Kozhikode

1. Sessions were interactive, which made the training even more interesting.
2. Would be good to include a site visit to see the real practices and methods if the training duration was longer.








3. The training needs to cover more practical and simple methods of disaster resilient construction.
4. Would be better if the facilitator knows the context familiar to the participants.
5. Needed more information on retrofitting and adaptability of existing buildings for future floods.
6. Need to get more local examples and solutions from such sessions.
7. A mixed group of participants would have been helpful. Also inclusion of real life case studies.
8. Such training courses should be organized for a longer time frame and include practical sessions.
9. Needed some content on innovative material that can be made use of for disaster resilient construction.

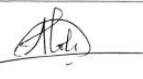



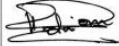
## 8. RECOMMENDATIONS

**Extension of Learning:** The programme provided a good learning and sharing space to the participants, and the scope for this learning can be extended vastly through follow-up learning capsules and sessions either through the programme team of UNDP or external resources.

## 9. LIST OF PARTICIPANTS








### 1) Thiruvananthapuram (20<sup>th</sup> November 2019)







Sl No	Name	Profession and Organization	Phone number	Email Id	Signature
1	A.S.Aravindh	Aravindh Associates	9790927621	asa@asa.ind.in	
2	SMITHA M.V	Asst. Prof. (Arch), CET	9746964833	smithamv@cet.ac.in	
3	ASWIN Y.V.	ARCHITECT	8921356389	aswinvros07@gmail.com	
4	SARITHA SHAJI	DEPUTY ARCHITECT, P.W.D	9446022346	ansarithashaji@gmail.com	
5	Ajayakumar.S.S.	Senior Architect PWD	9666390280	ajay.sivadasan@gmail.com	
6	Jayaram.G.S	Architect	9495115689	jayaramgs@gmail.com	
7	Lizwin Kurian	Architect	9496510633	lizwin.kurian@gmail.com	

Sl No	Name	Profession and Organization	Phone number	Email Id	Signature
08	Abhis Dinesh	Architect	9400604106	abhis.dinesh@gmail.com	
09	Lija Rachel Chandy	Architect	8547393448	lija@rao.org.in	
10	Anjana S.M	Architect	9633945844	anjansm04@gmail.com	
11	Abraham Doshun Sumanam	Engineer	9745420055	ajsunmum@gmail.com	
12	Rodni Tom	Architect	9995256409	rodni25@gmail.com	

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**2) Kozhikode (22<sup>nd</sup> November 2019)**

Sl No	Name	Profession and Organization	Phone number	Email Id	Signature
1	Anthony Augustine	Architect Tangram Design Philosophy	9539692489	tangram.dp@gmail.com	
2	Reelka T.K	Architect, Oasish Architects	9400696581	ar.reelkaravindrane@gmail.com	
3	Mahsifa.K	Architect	7736436700	mahsifat@gmail.com	
4	Harisankar P	Engineer, PMA7 Kozhikode corporation	8891242925	hari.ce86@gmail.com	
5	Jishnu Sanjay	Architect	8547639911	ar.jishnusankar@gmail.com	
6	Praveen Ram	Architect	9846314181	theswcorner@gmail.com	
7	P.m. SURISH	Engineer	9947065500	pmsurish@gmail.com	

Sl No	Name	Profession and Organization	Phone number	Email Id	Signature
8	KAILAS UNNIKRISSHIAN	STUDIO 3AM ARCHITECT	8547905262	kailas.95@gmail.com	
9	Mohammed Atcheal	Studio 3AM architect	8943739437	atcheal.p.arch@gmail.com	
10	Jackson Paul	Studio 3AM architect	9495937647	jacksonpaulkuttasery@gmail.com	
11	MOHAMMAD KUNHAMMED	STUDIO 3AM ARCHITECT	8157908568	mhmmd411@gmail.com	
12	Aungmya Suresh	ARCHITECT	9446063122	aungmyasuresh@gmail.com	
13	UMER ALI	Architect	9567983657	umerali@aol.in	





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**Address**

RedR India

Laxmi Krupa", Survey No. 77/2,

Behind Ved Bhavan,

Near Chitrapur Math,

Chandani Chowk, Kothrud,

Pune - 411 038, Maharashtra, India.

Tele: + 91 20 25280454, +91 7028198901

For more information about RedR India, mail us at [info@redrindia.org](mailto:info@redrindia.org)