

ಕರ್ನಾಟಕ ವಿಧಾನ ಪರಿಷತ್ತು

ಚುಕ್ಕೆ ಗುರುತಿಲ್ಲದ ಪ್ರಶ್ನೆ ಸಂಖ್ಯೆ : 617
 ಸದಸ್ಯರ ಹೆಸರು : ಶ್ರೀ ಕೆ.ಎ.ತಿಪ್ಪೇಸ್ವಾಮಿ (ನಾಮನಿರ್ದೇಶನ ಹೊಂದಿದವರು)
 ಉತ್ತರಿಸಬೇಕಾದ ದಿನಾಂಕ : 11-07-2023
 ಉತ್ತರಿಸುವ ಸಚಿವರು : ನಗರಾಭಿವೃದ್ಧಿ ಮತ್ತು ನಗರ ಯೋಜನೆ ಸಚಿವರು

ಕ್ರ. ಸಂ	ಪ್ರಶ್ನೆ	ಉತ್ತರ																																																																																									
ಅ)	<p>ರಾಜ್ಯದಲ್ಲಿ ಕೇಂದ್ರ ಸರ್ಕಾರದ ಮಹತ್ವಾಕಾಂಕ್ಷೆ ಯೋಜನೆಯಾದ "ಸ್ಕಾರ್ಟ್‌ಸಿಟಿ ಯೋಜನೆ" ಅಡಿಯಲ್ಲಿ ಆಯ್ಕೆಯಾಗಿರುವ ನಗರಗಳು ಯಾವುವು; ಮತ್ತು ಈ ನಗರಗಳನ್ನು ಸಾರ್ವಜನಿಕ-ಖಾಸಗಿ ಸಹಭಾಗಿತ್ವದಲ್ಲಿ ಕೈಗೊಳ್ಳಲಾಗಿದೆಯೇ; (ಪೂರ್ಣ ಮಾಹಿತಿ ನೀಡುವುದು)</p>	<p>ಕೇಂದ್ರ ಸರ್ಕಾರ ಪ್ರಾಯೋಜಿತ ಸ್ಕಾರ್ಟ್ ಸಿಟಿ ಅಭಿಯಾನದಡಿ ರಾಜ್ಯದ 7 ನಗರಗಳಾದ ಬೆಳಗಾವಿ, ದಾವಣಗೆರೆ, ಹುಬ್ಬಳ್ಳಿ-ಧಾರವಾಡ, ಮಂಗಳೂರು, ಶಿವಮೊಗ್ಗ, ತುಮಕೂರು ಹಾಗೂ ಬೆಂಗಳೂರು ನಗರಗಳು ಆಯ್ಕೆಯಾಗಿರುತ್ತವೆ.</p> <p>ಅಭಿಯಾನದಡಿ ಆಯ್ಕೆಯಾದ ಪ್ರತಿ ನಗರಕ್ಕೆ ಕೇಂದ್ರ ಹಾಗೂ ರಾಜ್ಯ ಸರ್ಕಾರದಿಂದ ತಲಾ ರೂ.500.00 ಕೋಟಿಯಂತೆ ಒಟ್ಟು ರೂ.1000.00 ಕೋಟಿ ಅನುದಾನ ನಿಗದಿಯಾಗಿರುತ್ತದೆ.</p> <p>ಮುಂದುವರೆದು, ಸ್ಕಾರ್ಟ್ ಸಿಟಿ ಅಭಿಯಾನವು ನಗರಗಳಲ್ಲಿನ ಮೂಲಭೂತ ಸೌಕರ್ಯಗಳನ್ನು ಅಭಿವೃದ್ಧಿಗೊಳಿಸಲು ಸಾರ್ವಜನಿಕ-ಖಾಸಗಿ ಸಹಭಾಗಿತ್ವ (ಪಿಪಿಪಿ) ಮಾದರಿಯಲ್ಲಿ ಸಹಾ ಕಾಮಗಾರಿಗಳನ್ನು ತೆಗೆದುಕೊಳ್ಳಲು ಉತ್ತೇಜಿಸುತ್ತದೆ. ಅದರಂತೆ, ರಾಜ್ಯದ 7 ನಗರಗಳಲ್ಲಿ ಪಿಪಿಪಿ ಮಾದರಿಯಡಿ ಒಟ್ಟು-26 ಕಾಮಗಾರಿಗಳನ್ನು ಕೈಗೊಳ್ಳಲಾಗಿದೆ. ನಗರವಾರು ವಿವರ ಈ ಕೆಳಕಂಡಂತಿವೆ:</p> <p style="text-align: right;">(ರೂ.ಕೋಟಿಗಳಲ್ಲಿ)</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th rowspan="2">ನಗರ</th> <th colspan="2">ಒಟ್ಟು ಪಿಪಿಪಿ ಕಾಮಗಾರಿಗಳು</th> <th colspan="2">ಪೂರ್ಣಗೊಂಡ ಪಿಪಿಪಿ ಕಾಮಗಾರಿಗಳು</th> <th colspan="2">ಪ್ರಗತಿಯಲ್ಲಿರುವ ಪಿಪಿಪಿ ಕಾಮಗಾರಿಗಳು</th> <th colspan="2">ಟೆಂಡರ್ ಹಂತದಲ್ಲಿರುವ ಪಿಪಿಪಿ ಕಾಮಗಾರಿಗಳು</th> </tr> <tr> <th>ಸಂಖ್ಯೆ</th> <th>ಮೊತ್ತ</th> <th>ಸಂಖ್ಯೆ</th> <th>ಮೊತ್ತ</th> <th>ಸಂಖ್ಯೆ</th> <th>ಮೊತ್ತ</th> <th>ಸಂಖ್ಯೆ</th> <th>ಮೊತ್ತ</th> </tr> </thead> <tbody> <tr> <td>ಬೆಳಗಾವಿ</td> <td>6</td> <td>211.06</td> <td>1</td> <td>4.90</td> <td>5</td> <td>206.16</td> <td>0</td> <td>0</td> </tr> <tr> <td>ದಾವಣಗೆರೆ</td> <td>5</td> <td>39.65</td> <td>5</td> <td>39.65</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>ಹುಬ್ಬಳ್ಳಿ-ಧಾರವಾಡ</td> <td>1</td> <td>50.00</td> <td>0</td> <td>0</td> <td>1</td> <td>50.00</td> <td>0</td> <td>0</td> </tr> <tr> <td>ಮಂಗಳೂರು</td> <td>4</td> <td>262.79</td> <td>0</td> <td>0</td> <td>4</td> <td>262.79</td> <td>0</td> <td>0</td> </tr> <tr> <td>ಶಿವಮೊಗ್ಗ</td> <td>3</td> <td>185.76</td> <td>1</td> <td>44.42</td> <td>1</td> <td>1.24</td> <td>1</td> <td>140.10</td> </tr> <tr> <td>ತುಮಕೂರು</td> <td>7</td> <td>350.30</td> <td>0</td> <td>179.07</td> <td>4</td> <td>171.23</td> <td>0</td> <td>0</td> </tr> <tr> <td>ಬೆಂಗಳೂರು</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>ಒಟ್ಟು</td> <td>26</td> <td>1099.56</td> <td>0</td> <td>268.04</td> <td>15</td> <td>691.42</td> <td>1</td> <td>140.10</td> </tr> </tbody> </table>	ನಗರ	ಒಟ್ಟು ಪಿಪಿಪಿ ಕಾಮಗಾರಿಗಳು		ಪೂರ್ಣಗೊಂಡ ಪಿಪಿಪಿ ಕಾಮಗಾರಿಗಳು		ಪ್ರಗತಿಯಲ್ಲಿರುವ ಪಿಪಿಪಿ ಕಾಮಗಾರಿಗಳು		ಟೆಂಡರ್ ಹಂತದಲ್ಲಿರುವ ಪಿಪಿಪಿ ಕಾಮಗಾರಿಗಳು		ಸಂಖ್ಯೆ	ಮೊತ್ತ	ಸಂಖ್ಯೆ	ಮೊತ್ತ	ಸಂಖ್ಯೆ	ಮೊತ್ತ	ಸಂಖ್ಯೆ	ಮೊತ್ತ	ಬೆಳಗಾವಿ	6	211.06	1	4.90	5	206.16	0	0	ದಾವಣಗೆರೆ	5	39.65	5	39.65	0	0	0	0	ಹುಬ್ಬಳ್ಳಿ-ಧಾರವಾಡ	1	50.00	0	0	1	50.00	0	0	ಮಂಗಳೂರು	4	262.79	0	0	4	262.79	0	0	ಶಿವಮೊಗ್ಗ	3	185.76	1	44.42	1	1.24	1	140.10	ತುಮಕೂರು	7	350.30	0	179.07	4	171.23	0	0	ಬೆಂಗಳೂರು	0	0	0	0	0	0	0	0	ಒಟ್ಟು	26	1099.56	0	268.04	15	691.42	1	140.10
ನಗರ	ಒಟ್ಟು ಪಿಪಿಪಿ ಕಾಮಗಾರಿಗಳು			ಪೂರ್ಣಗೊಂಡ ಪಿಪಿಪಿ ಕಾಮಗಾರಿಗಳು		ಪ್ರಗತಿಯಲ್ಲಿರುವ ಪಿಪಿಪಿ ಕಾಮಗಾರಿಗಳು		ಟೆಂಡರ್ ಹಂತದಲ್ಲಿರುವ ಪಿಪಿಪಿ ಕಾಮಗಾರಿಗಳು																																																																																			
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ಆ) ಈ ಯೋಜನೆ ಅಡಿ ಆಯ್ಕೆಯಾಗಿರುವ ನಗರಗಳಲ್ಲಿ ಕೈಗೊಂಡಿರುವ ವಿವಿಧ ಕಾಮಗಾರಿಗಳ ಅನುಷ್ಠಾನ ಯಾವ ಹಂತದಲ್ಲಿವೆ ಮತ್ತು ನಿಗದಿತ ಭೌತಿಕ ಮತ್ತು ಆರ್ಥಿಕ ಗುರಿಗಳನ್ನು ಸಾಧಿಸಲಾಗಿದೆಯೇ; (ಪೂರ್ಣ ಮಾಹಿತಿ ನೀಡುವುದು)

ಸ್ಮಾರ್ಟ್ ಸಿಟಿ ಅನುದಾನದಡಿ ಕೈಗೊಂಡಿರುವ ಕಾಮಗಾರಿಗಳ ವಿವರ

(ರೂ.ಕೋಟಿಗಳಲ್ಲಿ)

ನಗರ	ಒಟ್ಟು ಕಾಮಗಾರಿಗಳು		ಪೂರ್ಣಗೊಂಡ ಕಾಮಗಾರಿಗಳು		ಪ್ರಗತಿಯಲ್ಲಿರುವ ಕಾಮಗಾರಿಗಳು		ಟೆಂಡರ್ ಹಂತದಲ್ಲಿರುವ ಕಾಮಗಾರಿಗಳು	
	ಸಂಖ್ಯೆ	ಮೊತ್ತ	ಸಂಖ್ಯೆ	ಮೊತ್ತ	ಸಂಖ್ಯೆ	ಮೊತ್ತ	ಸಂಖ್ಯೆ	ಮೊತ್ತ
ಬೆಳಗಾವಿ	102	929.02	96	775.32	6	153.70	0	0.00
ದಾವಣಗೆರೆ	109	965.98	96	674.08	13	291.90	0	0.00
ಹುಬ್ಬಳ್ಳಿ-ಧಾರವಾಡ	62	948.67	57	625.32	5	323.35	0	0.00
ಮಂಗಳೂರು	57	939.01	35	360.64	22	578.37	0	0.00
ಶಿವಮೊಗ್ಗ	71	930.00	65	842.38	6	87.62	0	0.00
ತುಮಕೂರು	180	933.66	174	818.90	6	114.76	0	0.00
ಬೆಂಗಳೂರು	44	930.00	37	629.73	7	300.27	0	0.00
ಒಟ್ಟು	625	6576.34	560	4726.37	65	1849.97	0	0.00

ವಿವಿಧ ಮಾದರಿಯಡಿ ಕೈಗೊಂಡಿರುವ ಕಾಮಗಾರಿಗಳ ವಿವರ

(ರೂ.ಕೋಟಿಗಳಲ್ಲಿ)

ನಗರ	ಒಟ್ಟು ಕಾಮಗಾರಿಗಳು		ಪೂರ್ಣಗೊಂಡ ಕಾಮಗಾರಿಗಳು		ಪ್ರಗತಿಯಲ್ಲಿರುವ ಕಾಮಗಾರಿಗಳು		ಟೆಂಡರ್ ಹಂತದಲ್ಲಿರುವ ಕಾಮಗಾರಿಗಳು	
	ಸಂಖ್ಯೆ	ಮೊತ್ತ	ಸಂಖ್ಯೆ	ಮೊತ್ತ	ಸಂಖ್ಯೆ	ಮೊತ್ತ	ಸಂಖ್ಯೆ	ಮೊತ್ತ
ಬೆಳಗಾವಿ	6	211.06	1	4.9	5	206.16	0	0
ದಾವಣಗೆರೆ	5	39.65	5	39.65	0	0	0	0
ಹುಬ್ಬಳ್ಳಿ-ಧಾರವಾಡ	1	50	0	0	1	50	0	0
ಮಂಗಳೂರು	4	262.79	0	0	4	262.79	0	0
ಶಿವಮೊಗ್ಗ	3	185.76	1	44.42	1	1.24	1	140.1
ತುಮಕೂರು	7	350.30	3	179.07	4	171.23	0	0.00
ಬೆಂಗಳೂರು	0	0	0	0	0	0	0	0
ಒಟ್ಟು	26	1099.56	10	268.04	15	691.42	1	140.1

ರಾಜ್ಯದ 7 ಸ್ಮಾರ್ಟ್ ಸಿಟಿಗಳಿಗೆ ಈವರೆಗೆ ಬಿಡುಗಡೆಯಾಗಿರುವ ಹಾಗೂ ಬಳಕೆಯಾದ ಅನುದಾನದ ವಿವರ ಈ ಕೆಳಗಿನಂತಿದೆ;

(ರೂ.ಕೋಟಿಗಳಲ್ಲಿ)

ನಗರ	ಈವರೆಗೆ ಬಿಡುಗಡೆಯಾದ ಅನುದಾನದ ವಿವರ			ಈವರೆಗಿನ ವೆಚ್ಚ
	ಕೇಂದ್ರ ಸರ್ಕಾರ	ರಾಜ್ಯ ಸರ್ಕಾರ	ಒಟ್ಟು	
ಬೆಳಗಾವಿ	441.00	441.00	882.00	856.88 (ಶೇ.97%)
ದಾವಣಗೆರೆ	441.00	441.00	882.00	806.96 (ಶೇ.91%)
ಹುಬ್ಬಳ್ಳಿ-ಧಾರವಾಡ	392.00	414.00	806.00	764.81 (ಶೇ.95%)
ಮಂಗಳೂರು	392.00	414.00	806.00	739.39 (ಶೇ.92%)
ಶಿವಮೊಗ್ಗ	490.00	464.00	954.00	884.29 (ಶೇ.93%)
ತುಮಕೂರು	490.00	441.00	931.00	859.55 (ಶೇ.92%)
ಬೆಂಗಳೂರು	390.00	414.00	804.00	782.00 (ಶೇ.97%)
ಒಟ್ಟು	3036.00	3029.00	6065.00	5693.88 (ಶೇ.94%)


ಈ ಯೋಜನೆ ಅಡಿಯಲ್ಲಿ ಗುರುತಿಸಲಾಗಿರುವ ಕೂಲಿಗರಿ ಪ್ರದೇಶಗಳನ್ನು ಮತ್ತೆ ಇಲ್ಲಿಗೆ ಮತ್ತು ಸ್ಥಳಾಂತರ ಮತ್ತು ಪುನರ್ವಸತಿಗಾಗಿ ರೂಪುಗೊಂಡಿರುವ ಕಾರ್ಯಕ್ರಮಗಳು ಯಾವುವು; (ಪ್ರೋಜೆ ವಿವರ ನೀಡುವುದು)

ಮೇಲೆ ವಿವರಿಸಿದಂತೆ ರಾಜ್ಯದ 7 ನಗರಗಳಲ್ಲಿ ಸ್ವೀಕೃತ ಸಿಟಿ ಅನುದಾನದಡಿ ಹೈಕೋಶೋಲಾಗಿರುವ ಒಟ್ಟು 560 ಕಾರುಗಳನ್ನು (ಶೇ.90%) ಪುನರ್ವಸತಿಗಾಗಿ ಮತ್ತು 65 ಕಾರುಗಳನ್ನು (ಶೇ.10%) ಮತ್ತು ಪ್ರಗತಿಯಲ್ಲಿರುವ ಟೆಂಡರ್ ಹಂತದಲ್ಲಿರುವ 15 ಕಾರುಗಳನ್ನು ಮತ್ತು (ಶೇ.58%) ಪ್ರಗತಿಯಲ್ಲಿರುವ 1 ಏಜಿ ಕಾರುಗಳನ್ನು ಮತ್ತು ಸರ್ಕಾರವು ಸ್ವೀಕೃತ ಸಿಟಿ ಅನುದಾನದ ಕಾಲಾಬಂಧನ ಮತ್ತು ಜೂನ್-2024 ರವರೆಗೆ ವಿಸ್ತರಿಸಿತ್ತು. ಈ ಕಾಲಾವಧಿಯಲ್ಲಿ ಪ್ರಗತಿಯಲ್ಲಿರುವ ಬಾಕಿ ಕಾರುಗಳನ್ನು ಪುನರ್ವಸತಿಗಾಗಿ ಮತ್ತು ಹೈಕೋಶೋಲಾಗಿರುವ ಒಟ್ಟು 26 ಕಾರುಗಳನ್ನು (ಶೇ.38%) ಪುನರ್ವಸತಿಗಾಗಿ ಮತ್ತು 1 ಏಜಿ ಕಾರುಗಳನ್ನು (ಶೇ.58%) ಪ್ರಗತಿಯಲ್ಲಿರುವ 15 ಕಾರುಗಳನ್ನು ಮತ್ತು (ಶೇ.10%) ಮತ್ತು ಟೆಂಡರ್ ಹಂತದಲ್ಲಿರುವ 15 ಕಾರುಗಳನ್ನು ಮತ್ತು (ಶೇ.58%) ಪ್ರಗತಿಯಲ್ಲಿರುವ 1 ಏಜಿ ಕಾರುಗಳನ್ನು ಮತ್ತು ಸರ್ಕಾರವು ಸ್ವೀಕೃತ ಸಿಟಿ ಅನುದಾನದ ಕಾಲಾಬಂಧನ ಮತ್ತು ಜೂನ್-2024 ರವರೆಗೆ ವಿಸ್ತರಿಸಿತ್ತು. ಈ ಕಾಲಾವಧಿಯಲ್ಲಿ ಪ್ರಗತಿಯಲ್ಲಿರುವ ಬಾಕಿ ಕಾರುಗಳನ್ನು ಪುನರ್ವಸತಿಗಾಗಿ ಮತ್ತು ಹೈಕೋಶೋಲಾಗಿರುವ ಒಟ್ಟು 26 ಕಾರುಗಳನ್ನು (ಶೇ.38%) ಪುನರ್ವಸತಿಗಾಗಿ ಮತ್ತು 1 ಏಜಿ ಕಾರುಗಳನ್ನು (ಶೇ.58%) ಪ್ರಗತಿಯಲ್ಲಿರುವ 15 ಕಾರುಗಳನ್ನು ಮತ್ತು (ಶೇ.10%) ಮತ್ತು ಟೆಂಡರ್ ಹಂತದಲ್ಲಿರುವ 15 ಕಾರುಗಳನ್ನು ಮತ್ತು (ಶೇ.58%) ಪ್ರಗತಿಯಲ್ಲಿರುವ 1 ಏಜಿ ಕಾರುಗಳನ್ನು ಮತ್ತು ಸರ್ಕಾರವು ಸ್ವೀಕೃತ ಸಿಟಿ ಅನುದಾನದಡಿ ಕೂಲಿಗರಿ ಪ್ರದೇಶಗಳ ಅಭಿವೃದ್ಧಿಗೆ ಕೈಗೊಳ್ಳಲಾಗಿರುವ ಕಾರುಗಳ ಬಗ್ಗೆ ನಗರವಾರು ವಿವರಗಳು ಈ ಕೆಳಗಿನಂತಿವೆ:

ನಗರ	ಕೂಲಿಗರಿ ಅಭಿವೃದ್ಧಿ ಕಾರುಗಳ ಹೆಸರು	ಕಾರುಗಳ ಸಂಖ್ಯೆ (ರೂ.ಕೋಟಿ)	ಪ್ರಸ್ತುತ ಹಂತ
ಬೆಳಗಾವಿ	ರುಕ್ಮಿಣಿ ನಗರ ಕೋಶ ಪ್ರದೇಶದ ಅಭಿವೃದ್ಧಿ	4.14	ಕಾರುಗಳ ಸಂಖ್ಯೆ
ಹುಬ್ಬಳ್ಳಿ-ಧಾರವಾಡ	ನಗರದ ಪ್ರದೇಶದ ಬಡಜನರಿಗೆ ಮೂಲಭೂತ ಸೌಕರ್ಯ ಯೋಜನೆ ಪ್ರಾಜೆಕ್ಟ್-01 (62 ರಸ್ತೆಗಳು)	29.75	ಕಾರುಗಳ ಸಂಖ್ಯೆ
ಹುಬ್ಬಳ್ಳಿ-ಧಾರವಾಡ	ನಗರದ ಪ್ರದೇಶದ ಬಡಜನರಿಗೆ ಮೂಲಭೂತ ಸೌಕರ್ಯ ಯೋಜನೆ ಪ್ರಾಜೆಕ್ಟ್-02 (69 ರಸ್ತೆಗಳು)	39.40	ಕಾರುಗಳ ಸಂಖ್ಯೆ
ಹುಬ್ಬಳ್ಳಿ-ಧಾರವಾಡ	ನಗರದ ಪ್ರದೇಶದ ಬಡಜನರಿಗೆ ಮೂಲಭೂತ ಸೌಕರ್ಯ ಯೋಜನೆ ಪ್ರಾಜೆಕ್ಟ್-03 (35 ರಸ್ತೆಗಳು)	28.39	ಕಾರುಗಳ ಸಂಖ್ಯೆ
ಹುಬ್ಬಳ್ಳಿ-ಧಾರವಾಡ	ನಗರದ ಪ್ರದೇಶದ ಬಡಜನರಿಗೆ ಮೂಲಭೂತ ಸೌಕರ್ಯ ಯೋಜನೆ ಪ್ರಾಜೆಕ್ಟ್-04 (ಬಾಣ್ಣೆನಾಸ್) - ರಸ್ತೆ ಯೋಜನೆ (80 ಮನೆಗಳು)	13.82	ಕಾರುಗಳ ಸಂಖ್ಯೆ
ಚಿಕ್ಕಬಳ್ಳಾಪುರ	ಕೈಗಟಪುರ ಪ್ರದೇಶದ ಬಡಜನರಿಗೆ ಮೂಲಭೂತ ಸೌಕರ್ಯ ಯೋಜನೆ ಪ್ರಾಜೆಕ್ಟ್-01 (87 ಮನೆಗಳು)	14.00	ಕಾರುಗಳ ಸಂಖ್ಯೆ

<p>ಈ) ಸ್ಮಾರ್ಟ್ ಸಿಟಿ ಯೋಜನೆ ಅಡಿ ಎಷ್ಟು ನಗರಗಳು ಅಂತರ ರಾಷ್ಟ್ರೀಯ ನಗರಗಳೆಂದಿಗೆ "ಸಹೋದರಿನಗರ" (Sister City) ಒಡಂಬಡಿಕೆ ಮಾಡಿಕೊಳ್ಳಲಾಗಿದೆ; (ಪೂರ್ಣ ವಿವರ ನೀಡುವುದು)</p>	<p>ಸ್ಮಾರ್ಟ್ ಸಿಟಿ ಯೋಜನೆಯಡಿ ರಾಜ್ಯದ ತುಮಕೂರು ನಗರ ಮಾತ್ರ ಡೆನ್ಮಾರ್ಕ್ ದೇಶದ ಆಲ್ಬೋರ್ಗ್ ನಗರದೊಂದಿಗೆ ಸಾಂಸ್ಥಿಕ ಸಂಬಂಧಗಳನ್ನು ಬಲಪಡಿಸಲು "ಸಹೋದರಿ ನಗರ" (Sister City) ಒಡಂಬಡಿಕೆ ಮಾಡಿಕೊಂಡಿರುತ್ತಾರೆ.</p> <p>ತುಮಕೂರು ಮತ್ತು ಆಲ್ಬೋರ್ಗ್ ನಗರಗಳ ನಡುವಿನ ಒಪ್ಪಂದವು ಸುಸ್ಥಿರ ಪರಿವರ್ತನೆಗಾಗಿ ನಗರ ಯೋಜನೆ ಮತ್ತು ಅಭಿವೃದ್ಧಿ, ಸ್ಮಾರ್ಟ್ ಶಿಕ್ಷಣ, ನಗರ ನೀರಿನ ನಿರ್ವಹಣೆ, ತ್ಯಾಜ್ಯ ನಿರ್ವಹಣೆ, ಡಿಜಿಟಲ್ ಪರಿಹಾರ ಸೇರಿದಂತೆ ಆರೋಗ್ಯ, ಇ-ಆಡಳಿತ ಕ್ಷೇತ್ರಗಳಲ್ಲಿ ಜ್ಞಾನ ವರ್ಗಾವಣೆಯನ್ನು ಉತ್ತೇಜಿಸುವುದು ಹಾಗೂ ನಿರಂತರ, ದೀರ್ಘ ದ್ವಿಪಕ್ಷೀಯ ಸಹಕಾರವನ್ನು ಸಕ್ರಿಯಗೊಳಿಸುವುದು ಒಡಂಬಡಿಕೆಯ ಮುಖ್ಯ ಉದ್ದೇಶವಾಗಿರುತ್ತದೆ.</p>
<p>ಉ) ರಾಜ್ಯದಲ್ಲಿ ಸ್ಮಾರ್ಟ್ ಸಿಟಿ ಯೋಜನೆ ಅನುಷ್ಠಾನದ ಬಗ್ಗೆ ಕೇಂದ್ರ ಅಥವಾ ರಾಜ್ಯ ಸರ್ಕಾರ ಅಧ್ಯಯನ ನಡೆಸಿದೆಯೇ; ಹಾಗಿದ್ದಲ್ಲಿ, ಅಧ್ಯಯನದ ಮುಖ್ಯ ಅಂಶಗಳು ಯಾವುವು? (ಪೂರ್ಣ ಮಾಹಿತಿ ನೀಡುವುದು)</p>	<p>ಸ್ಮಾರ್ಟ್ ಸಿಟಿ ಅಭಿಯಾನದಡಿ ರಾಜ್ಯದ 7 ನಗರಗಳಲ್ಲಿ ಹಮ್ಮಿಕೊಳ್ಳಲಾಗಿರುವ ಕಾಮಗಾರಿಗಳು ಅನುಷ್ಠಾನದ ವಿವಿಧ ಹಂತಗಳಲ್ಲಿರುತ್ತವೆ.</p> <p>ಕೇಂದ್ರ ಸರ್ಕಾರವು ಅಭಿಯಾನದ ಆಯ್ದ ನಗರಗಳಲ್ಲಿನ ಕೆಲವು ಪ್ರಮುಖ/ಪರಿಣಾಮಕಾರಿ ಕಾಮಗಾರಿಗಳನ್ನು ಗುರುತಿಸಿ ನಗರದಲ್ಲಿ ಆ ಕಾಮಗಾರಿಗಳು ಮೂಡಿಸಿದ ಪರಿಣಾಮಗಳನ್ನು ದಾಖಲಿಸುವ ಕಾರ್ಯ ಆರಂಭಿಸಿದೆ.</p> <p>ಅದರಂತೆ ಕೇಂದ್ರ ಸರ್ಕಾರವು ರಾಜ್ಯದ ದಾವಣಗೆರೆ, ಹುಬ್ಬಳ್ಳಿ-ಧಾರವಾಡ, ಮಂಗಳೂರು, ಶಿವಮೊಗ್ಗ, ಹಾಗೂ ತುಮಕೂರು ನಗರಗಳಲ್ಲಿನ ಕೆಲವೊಂದು ಕಾಮಗಾರಿಗಳಿಗೆ ನಡೆಸಿದ ಅಧ್ಯಯನದ ವರದಿಗಳ ಪ್ರತಿಯನ್ನು ಅನುಬಂಧದಲ್ಲಿ ನೀಡಿದೆ.</p>

ಸಂಖ್ಯೆ:ನಅಇ 86 ಸಿಎನ್‌ಎಸ್ 2023


13/07/2023
(ಬಿ.ಎಸ್.ಸುರೇಶ್)

ನಗರಾಭಿವೃದ್ಧಿ ಮತ್ತು ನಗರ ಯೋಜನೆ ಸಚಿವರು

A1

Escaping the City-Siege by Urban Floods: Case study of Davanagere Smart City, Karnataka

Name of the project: Escaping the City-Siege by Urban Floods
 Location: Davanagere
 Year of Project Implementation: 2019-2021
 Sector: Urban Infrastructure
 SDG: Sustainable Cities and Communities (SDG 11)
 Project Cost: ₹ 100 Crores
 SDG: 11

Adverse Impacts: None
 Students: 1000

Keywords: Urban Floods, Smart City, Davanagere

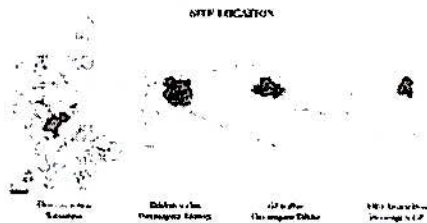
Case Study: AI

1. Introduction

Flooding truly disrupts the quotidian like no other crises and affects over 15 million people every year. Similar instances of water logging have brought several cities in the country to an abrupt halt. Several Indian metro cities such as Mumbai, Delhi, Chennai and Hyderabad are facing floods every single year, since the last two decades. An analysis conducted by the DTE-CSE Data Center of the Central Water Commission (CWC) reported that, since 1952, there has not been a single year where occurrences of floods haven't been reported. Unpredictable and increasing climate change, uncontrollable urbanization, and inadequate infrastructure are often cited as the major reasons behind urban flooding. A report furnished by SEEDS and CRED in 2018 observed that India has recorded a mean of 11 flood events per district over the last 18 years and suffered over INR 95,736 crores of economic loss in just 2019.

Urban flooding of such high magnitude and socio-economic and infrastructure losses cannot be contained by municipal authorities or the state governments alone. Floods cannot be averted without focused investments of energy and resources by the vested authorities, and can only be receded when stakeholders at all levels including the civil society and their allied organizations are involved through the planning, problem solving, implementation and monitoring processes. In order to minimize the intensity of the impact of floods, today's cities need to focus on developing risk-reductive and resilience inducing mechanisms as opposed to following the traditional rehabilitation and response centric approach to managing urban floods.

To this extent, the launch of the Smart Cities Mission (SCM) heralded a new paradigm for urban development in India. Rigid, top-down, normative planning practices were discarded and 'people-centric sustainable and inclusive' urban development that provided a contextual potential for scalability and replicability across the country was envisaged and adopted. To enable this



Map 1: Location of Davanagere in Karnataka.

paradigm shift, the Ministry of Housing and Urban Affairs (MoHUA) through the mission, has sparked innovation, fostered partnerships across sectors and facilitated the development of novel solutions to curb the most pressing urban concerns of the country, all the while strengthening the core infrastructure of the cities. An embodiment of the above-said principles can be viewed in Davanagere Smart City, where the smart city officials, officials from various ULBs, urban practitioners and the civil society came together to combat the recurring issue of urban flooding in the city.

2. Core Enquiry:

Davanagere, also known as the 'Manchester of Karnataka' is the seventh largest city in the state, currently serving as an administrative hub for Davanagere district. Accelerated urbanization (Map 2) coupled with inadequate and outdated infrastructure has put the city in a perilous position prone to sudden shocks and stresses such as torrential rains and flooding. However, the city of Davanagere, located in an upland region just east of the Tungabhadra river (Map 3), highlights the fact that the major reasons for recurring flooding since 2011, are due to human-made reasons as opposed to physical/geographical reasons.

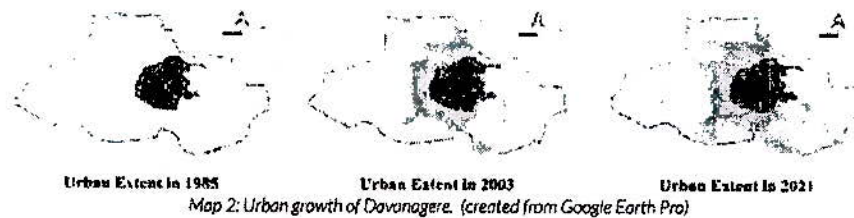
Noting the impact, the floods have had on connectivity, Mr. Siddeshwar Hebbal (Divisional Controller, KSRTC, Davanagere) reflected that "the KSRTC bus stand area

was often fully flooded, affecting the movement of buses and any other vehicles." Similarly, Mr. Jai Kumar, residing at 11th cross from the last 10 years, shared that flooding in his locality was quite dreadful, clogging majority of the drains and routes even during shorter duration of rainfall.

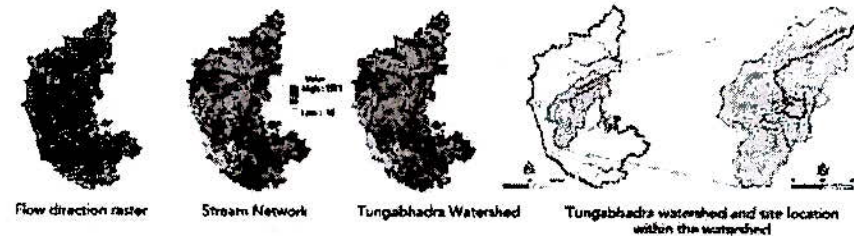
Outdated and inadequate physical infrastructure has thus resulted in reduction of infiltration land leading to low infiltration of rainwater (average of 647.54 mm a year) resulting in higher storm water runoff creating the issue of urban flooding. Additionally, due to discontinuity in the storm water drain network, rain water continually gets polluted when the storm water runoff meets the sewage water. Additionally, with the increase in infiltration land, irregular sections of drains, silt deposit along the drain tributaries, ill-maintained utility pipes across the drains, improper disposal of drainage lines and the reduction of urban water bodies owing to development, the issue of flooding intensifies with every passing year and so does its impact on the quotidian.

Mr. Irshid Shafi, identified that there was no pukka road due to which, during flooding, it became very difficult to commute to and from work. He shared that even after draining water, roads become slushy and difficult to be walk upon. Additionally, he also mentioned that people faced issues pertaining to drinking water, which was difficult to procure as roads were majorly blocked.

URBAN GROWTH



Map 2: Urban growth of Davanagere. (created from Google Earth Pro)



Map 3: Tungabhadra watershed w.r.t. the location of Davanagere smart city. (Created using LANDSAT data)

Flash floods in the city have also washed away a police constable in 2017 and a farmer in 2018. Mr. Ravindra B Mallapur, the current Managing Director of Davanagere Smart City Limited (DSCL) elaborated on the previous interventions undertaken in the city to combat flooding by saying that, "the issue of floods was targeted by the municipal corporation in a smaller scale. Although the minor irrigation department attempted to channelize the water through a side bund construction on the main nalla located in the northern side of the city, urban flooding was not completely resolved." According to the Chief Engineer at DSCL, "From time to time, various small projects were taken up by the corporation related to de-silting, cleaning and construction of drains but no comprehensive approach was attempted to solve the issue at a larger scale before the Smart City Mission."

To combat the issue of urban flooding, under the Smart Cities Mission a detailed stakeholder engagement was conducted under which 10 storm water drainage projects of a total length of 37.18 km were identified. Furthermore, waste water management was given the highest priority with a cumulative score of 7 via citizen's assessment since it was in a very poor condition. Due to the problems of excessive flooding of the low-lying areas of the city between the bridge on NH 4 and the Harihareshwara temple on the eastern bank of the Tungabhadra River the Davanagere Smart City brainstormed and implemented a series of storm-water infrastructure projects coupled with ICT initiatives, which when contextualized to the cities across the country could minimize the risk of flooding and

strengthen the physical infrastructure by at least 80%

3. Why Storm Water Management?

Storm water management reduces or eliminates the negative impacts of storm water runoff. Storm water management includes controlling flooding, reducing erosion and improving water quality which can be achieved by following Best Management Practices (BMPs). BMPs are structural, vegetative or managerial practices used to treat, prevent or reduce water pollution. Suitable measures to assist in maintaining the pre-development storm water discharges include:

- Retention/detention basins as part of a storm water treatment, increase in pervious areas on the site,
- The use of porous materials in those areas normally surfaced (such as footpaths); and the inclusion of on-site detention storage tanks with the design of multi-unit/building developments.

The storm water during the rainy season results in severe drainage and road damage owing to the runoff rainwater. The water on roads during rains remains stagnant for hours together due to poor storm water management and results in erosion of roads. In our country, industries and cities are facing a water crisis due to over exploitation of underground water and no provision for recharge of aquifers. Declining water levels are also consuming more energy in lifting the water and reducing green coverage. Solution of managing storm water on roads in urban and industrial areas is channelizing the same

to ground water systems in a hygienic manner. This method not only helps in controlling the devastating effects of storm water, but would improve ground water regime both in terms of rising water levels and increase in ground water availability. The techniques will also increase life of roads and reduce cost on maintenance and repairs. Besides, better plant growth is envisaged with less water requirement due to moist condition of surface soil through percolation structures.

4. Implementation Methodology

Soon after problem identification, the Davanagere Smart discussed the importance of solving urban flooding in a board meeting and the following major steps were followed to identify the problems and areas of interventions. The exercise started with a topographical survey conducted for the entire storm water drain alignment till disposal point at Bethur nalla along with a cross section of each drain at frequent intervals. Topographic survey was conducted for about 20.19 km covering the primary drain within the ABD (Map 4) area of Davanagere city. Furthermore, Geotechnical investigation was done for salient locations to establish the nature of the soil below the existing ground level and to assess the soil conditions along the proposed alignment of the storm water drain. The ground levels vary from a maximum of 622.72 m at the TV station, to a low level of 561.40 m near the existing STP.

According to the Smart City Proposal, 5 primary storm water drains were identified within the ABD (Area Based Development) area to avoid flooding. However, the identified primary storm water drains encompass the commercial area of the core city / old city and the storm water drains are K.R. Road, Basha Nagar main Road, In front of Fish market, Razaul Mustafa Nagar Main Road and Kondajji Road to SSM Nagar along with SPS Nagar road side drain. Bethur Nalla, which runs from south to north on the periphery of the city, is the main collector of all drainage in the city.

All the above-mentioned drains were studied in terms of their physical conditions such as length, age, type of masonry used, single- or double-sided structure and major problems associated with them such as silting, choking due to waste.

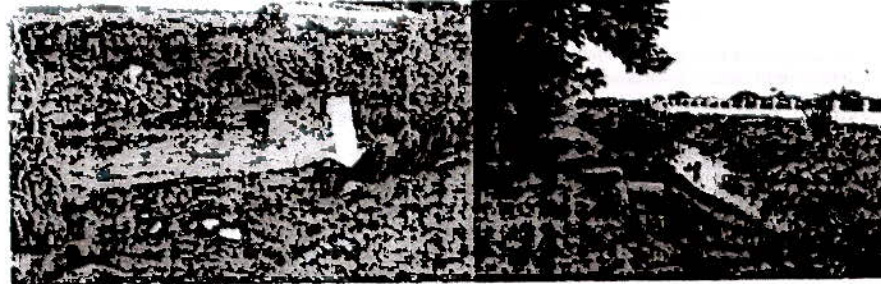


Image 1: Discontinuity and utility pipe issues in storm water drains.

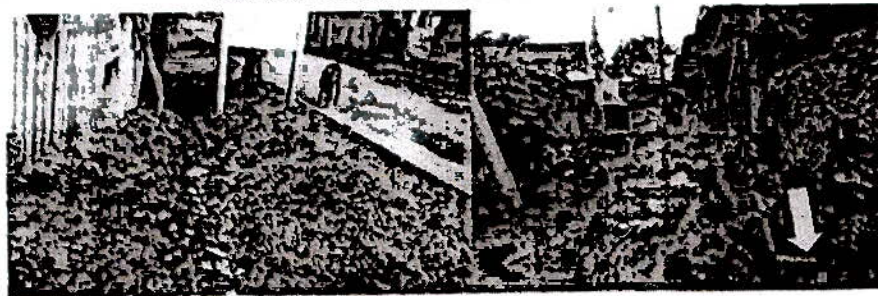
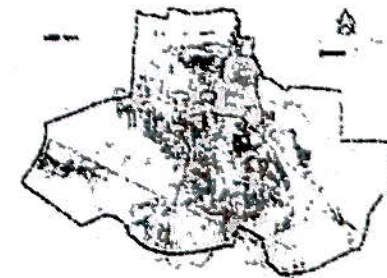


Image 2: Improper disposal point and irregular section of drain and silt deposition.



Map 4: ABD area within the city

The Chief Engineer at DSCL stated that "From 2002, urban flooding had been occurring in the 15 low-lying areas of the city. Mr. Ashadh Sharif the then MD of DSCL, took up the issue of solving the urban flooding and suggested drafting a project report. Nearly 100 km of the drains are being constructed across the city under the project. It was found that the projected carrying capacity of the drains were higher than their existing ones and thus, apart from construction of new drainage lines. Additionally, revamping of the old dilapidated ones was also undertaken." The critical zones were identified in the municipal corporation limits, which were the areas present in the low-lying region and had an improper drain system. The local media reports during the monsoon were analyzed to identify the critical areas of flooding during heavy rains. Additionally, from the comparative analysis of the peak discharge runoff and carrying capacity of the drains it was found that some of the drains had sufficient carrying capacity for proper movement of the rainwater while some didn't. Many drains needed some repairs and renovation while others

needed widening and deepening. Kutcha drains were causing a haphazard spread of rainwater and needed to be concretized. Cover slabs at some locations were missing.

The next step involved the preparation of the project proposal inclusive of extensive citizen engagement and stakeholder's consultation. The directly affected communities such as slum dwellers, street hawkers, shopkeepers and citizens residing across the 41 wards were involved. Further, being known as the 'Oxford of Karnataka', engagement with the teaching fraternity, the student community along with their family members was also conducted. The administrative stakeholders at city level via District Magistrate, Commissioner, Corporators, MLA of Davanagere and State Cabinet Minister were involved. The medium involved were face to face discussions, questionnaires, inviting suggestions through digital mediums like mygov, Facebook, twitter along with essay writing competitions.

5. Vision of the Davanagere SMART City

Located at the center of Karnataka with an area of 68,63 sq.km, the city is a residence of 4,34,971 people. The city is well connected via NH4 connecting to Hubli and Bangalore, SH 6S to Jagalur and SH 150 to Bellary. It is located on the Mumba-Bangalore rail line with the nearest ports at Karwar and Mangalore, nearest airport at Hubli and nearest international airport at Bangalore. The Davanagere municipal corporation has been divided into 8 districts for proper planning and management. The city is divided into two parts by the railway line - the southern part (newer developed area) which is more developed than the northern part (old city area).

The ABD (Area based development) area selected under the Smart City mission for retrofitting development is 3.2 sq.km dominated largely by commercial land uses. The area supports a population of 115779 with an average density of 34052 persons per sq km. Out of the 35 slums located in the city, 27 slums are located in and around the demarcated ABD area. Situated in the

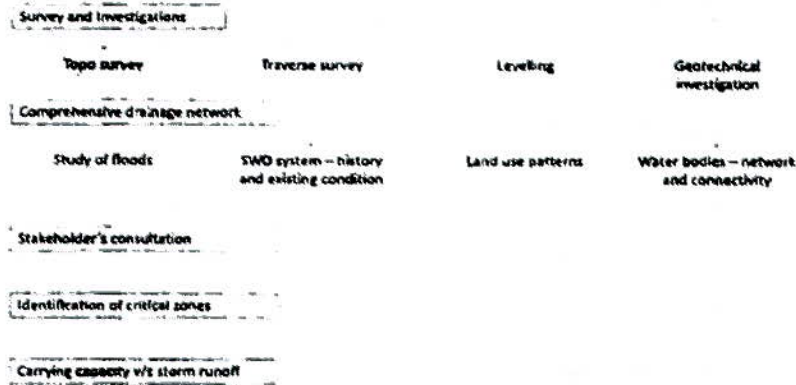
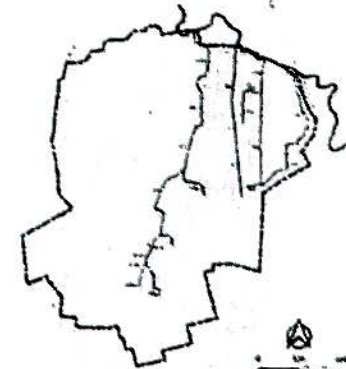
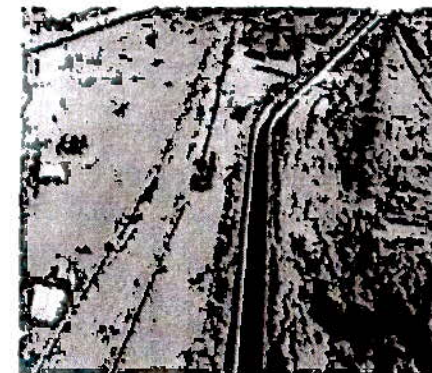
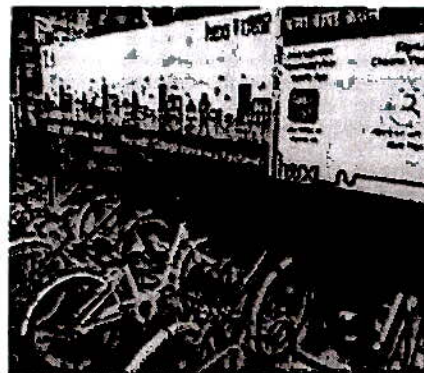
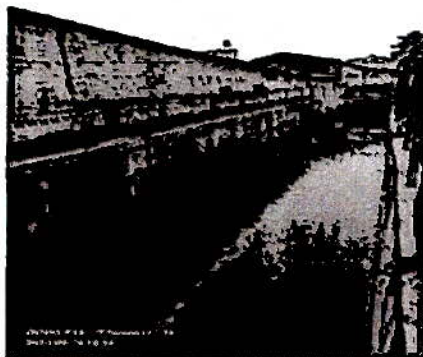


Image 3: Methodology for preparing the project proposal



Map 5: Main storm water drain within catchment area



Tungabhadra basin, the topography generally slopes towards north and west. The north-eastern and south-eastern part of the city drains towards north, through Bettur Nalla, whereas the western and southwestern part drains towards west, through Baathi Tanks.

Davanagere Smart City's vision is to be a city where LIFE nestles. L stands for livable, convenient and safe; I stand for inclusive; F stands for financially vibrant and futuristic and E stands for edutainment, economic prosperity and environment friendly. It aims to transform the unplanned and congested inner core of the city, which is negatively impacting the quality of life of the citizens. In accordance with the vision, the area-based proposal of Mandakki Bhatti enterprises has been identified for a retrofit focusing on heritage and cultural precinct redevelopment and economic hub creation whereas Pan City proposals aims to upgrade the city's urban mobility, by strategic and targeted ICT based solutions.

Each of the issues that were observed in the storm water drains led to a phase-wise method of development adopted by the DSCL. The intensely flooded areas in the ABD area were targeted first and the pan-city areas next. Width and depth of the proposed drains were designed keeping in mind the peak discharge of respective drains and old/damaged drains were replaced with new RCC rectangular ones with cover slabs at suitable places. As MD of DSCL says, "due to the absence of required SWD oriented infrastructure, the project focused on developing new infrastructure through SCM instead of revamping existing infrastructure."

The interventions attempted are further divided into structural and non-structural.

6. Structural interventions

In order to address the issues of the residents, problematic areas were identified, extensive discussions with stakeholders were held and projects were formulated under the Smart City Mission (SCM). These structural interventions included construction of major storm water drains and sub-drains across the city. These storm water gets mixed with the sewage and goes for treatment at sewage treatment plants situated outside the city. Further, after treatment at sewage treatment plants of 5 MLD and 20 MLD capacity, it meets Bethur Halla which ultimately discharges to the Tungabhadra River.

The total length of storm water drains proposed is 38.00 kms, out of these 38.00 kms, 27.38 kms of storm water drains are completed and the remaining is under construction. Defects of roads were rectified and new roads were laid under Smart City Mission (SCM) so that there should not be any potholes and no accumulation of water on roads. Slopes were made such that there should not be any stagnation of water on the pavement surface and pavement surface water can go to sub-drains along the road. These sub-drains are well connected to these storm water drains which go to Sewage treatment plants and after treatment finally discharge to Bethur Halla which ultimately meets Tungabhadra River. The groundwater recharge or storage aspect of the project was taken up in this city, since the domestic sewage from the entire city is flowing through the storm water drainage structure and this quality of water will contaminate the groundwater. However, under the smart road project in the Mandipet economic rejuvenation program, a storm water pipe network was provided with recharge arrangements in every collection chamber at frequent intervals.

7. Non-Structural interventions

Non-Structural interventions include spreading of awareness among people about throwing the garbage or solid waste in the drains. Residents were made to understand that utilities of chain-linked fencing, which is purposefully constructed with an aim to discourage people from throwing the garbage in storm water drains as garbage will obstruct the storm water leading to clogging of drains and flooding of the areas during rainy season.

8. Impact of Interventions

Urban storm water constitutes a non-point source of pollution, which contributes to the degradation of water bodies. With the specific structural and non-structural interventions undertaken by the Davanagere under the smart city mission, the issue of urban flooding has largely been solved. This was witnessed in the monsoon season of 2020 and 2021. The Mayor of Davanagere praised the works undertaken by the Smart City related to urban flooding and said "Presently, despite the heavy rainfall events, the water gets drained out easily. In the city area of Neelammathota, the storm water used to enter into the houses of the residents which had been solved through these interventions." Mr. Abdul Rahim, Corporator of Ward No. 3 which was adversely affected by the urban floods reflected how "the residents were facing problems related to urban floods from the past

20 years, but due to the efforts from the Smart City it has been resolved to a greater extent. The drains are constructed and linked from the Fish Market via Kochratti, Siddarameshwar Nagar, Ring road, Mancakki Bhatti, which finally gets discharged to Kalpanahalli Halla."

While the administrators and urban practitioners in Davanagere have vouched for the success of the project, the people living in the flood prone zones have agreed to the same. Mr. Ravi Rajappa, 34, a resident of Bhagat Singh Nagar residing in this locality for the last 30 years, has lived many a days shackled due to floods. He was quoted saying that "during floods, it generally took 2 to 3 days for water to drain out completely. I faced issues while going to his work and doing basic work. Flood water entered our house causing much difficulty. After the construction of drains, the problems have been resolved to a greater extent."

9. Conclusion

This effort of Davanagere Smart City is an example of how the Smart Cities Mission, has enabled the Indian cities to address the "urban problems of decades". The major takeaway from the case study analysis of Storm water drainage system development at Davanagere is the methodological approach of problem identification followed by a scientific and technical approach to solving the problem with people's participation at the center. It validates that the existing drainage system in our cities is unable to flush out water from heavy rains, and it requires a dedicated storm water drainage system.

This approach can be termed as best practice in terms of replicability and sustainability, as many cities across the Indian landscape can scale up the same process of implementation. While several cities have taken up projects related to development of storm water drains, the approach of Davanagere city has demonstrated a systematic approach and practical use of spaces available. To its credit, Davanagere Smart City extended the Storm water drainage network in three phases. Starting with the ABD area, the city has extended the network to PAN city, redesigning and developing the storm water drains, ending the city-siege of Davanagere from urban floods. This experimentation in ABD and further extension of learnings to the entire city, is in-line with the objectives of Smart Cities Mission.

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A28

Digital Library Solution For Tumkuru Central Library

Name of the project: Digital Library Solution For Tumkuru Central Library

Location: Tumakuru, Karnataka

Year of Project Implementation: 2019

Sector: Education, e-Governance, e-Content

SDG: SDG 4, SDG 8 and SDG 9

Project Cost: ₹ 33,250,000/-

Institute: Manipal School of Architecture and Planning

Advisors: Prof. Poojitha Muru Kesava

Students: Arjun, Anish, Anshu

Keywords: K.T. Digitalization, Smart City

Abstract:

Today information technology and network have become indispensable components in the context of Indian higher education that sector. The success of the ongoing research and development organizations, it plays a vital role. The progress of Information and communication technologies have led to development of computer networks. It is now possible to digitize and store information in the form of digital data. Graphics, network texts, color images, voice signals and video are being processed in affordable cost.

The Digital Library solution is part of the ongoing Special Education and IT (SEI) development. The report provides a better understanding on the IT services of Digital Library in Karnataka. The project's foundation is the concept of the project, its aim with content, its role, place and need, their preparation, its development, its impact, its presentation. Evaluating the Digital Library through its impact, its role, its place, its content, its services, its progress, and services. It also describes the role of digital library in the development of digital libraries.

Case Study: A28

1. Introduction

Tumakuru city is the headquarters of the Tumakuru district located in southeast Karnataka. (Ref Figure 1.1) Tumakuru City Population- 3,05,821 (2011 Census)

- Area- 48.21 Sq. Km.
- The population of the ABD Area- 43,941
- ABD Area- 5.48 Sq. Km.

1.1 Topic and Context

Tumakuru city is an educational hub housing two medical colleges, five engineering colleges, and many degree and PU colleges. Hence, the Library with relevant educational materials catering to the students and aspirants of competitive exams is the need of the hour. Tumakuru Central Library, located in the city's heart, houses a great collection of Kannada Sahitya and literature that can be easily accessed from different parts of the district. The Library is visited by readers of all age groups coming from various castes and taluks/villages. Therefore, the concept of the Digital Library was conceived to facilitate the readers and the avid readers in accessing the content without any restriction

The Digital Library is an Education oriented Project - Citizen-Centric project facilitating "Read it anywhere" conceived and implemented by Tumakuru Smart City in 2019. Tumakuru Digital Library is the first digitalization library project implemented in India under the Smart City

Karnataka

Tumakuru

Figure 1.1: Tumakuru District
Source: Webpage 1 (<https://en-academic.com/dic.nsf/enwiki/11648458>)

mission. It is an exquisite approach, and the uniqueness of this Digital Library, makes it stand the conventional libraries. It has a seamless collection of Digi-base with the facility. As of now, more than 26,000 users (students, teachers, lecturers, industry professionals, government officers, children, etc.) are using the facility, with not less than 20 users at an instance accessing the portal/application. Many cities have appreciated the initiative and have been making efforts to emulate the same.

1.2 Significance of the Project

- The digital library system at Tumakuru Central Library allows citizens to access digital content and e-books from anywhere.
- This project invites users from different parts of the city to improve their learning and gain knowledge easily.
- The monitoring of the borrowing is easy with ICT (Information and Communication Technology) interventions.
- The mobile app developed for Tumakuru Digital Library offers a collection of new releases, bestsellers, newspapers, journals, etc.
- This project also plays as a platform to bring out the talents of young minds and recreates the art of writing with the touch of technology.

1.3 Aim and Objectives

The study aims to examine the impact of the Digital Library in Tumakuru city. The report develops the

framework to evaluate the project and analyze the user activity.

The objectives of the study are:

- To identify the facility provided to the Digital Library Tumakuru.
- To understand the type of readers targeted and analysis the user activity.
- To analyze and report on the process of Digital Library.
- To assess the Digital Library considering the sustainable development goals and their relevance to the project.

2. Contextual Background

The concept of the Digital Library was brought into the light to enable the readers and knowledge enthusiasts, to help in accessing the content without any restrictions.

2.1 Conceptual Framework/Research Design

The purpose of the study is to assess the impact of the Digital Library in Tumakuru on the end users, considering the different parameters. The details and specifications of the project were provided by the Tumakuru Smart City Authority to acquire primary data. Secondary data will be obtained through the use of accurate and reliable questionnaires for the identification and description of potential links between positive and negative outcomes. This study used a non-experimental, empirical research

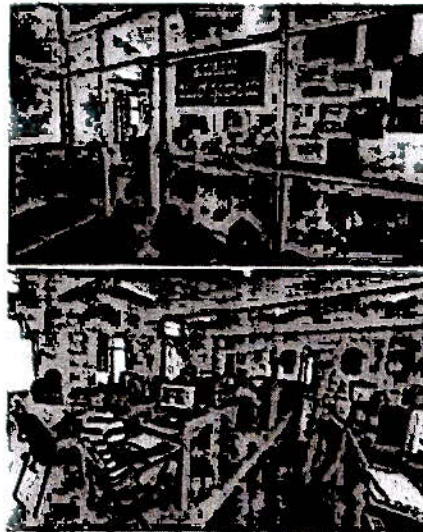


Figure 1.2: Typical Conservancy Lanes in Shivamogga

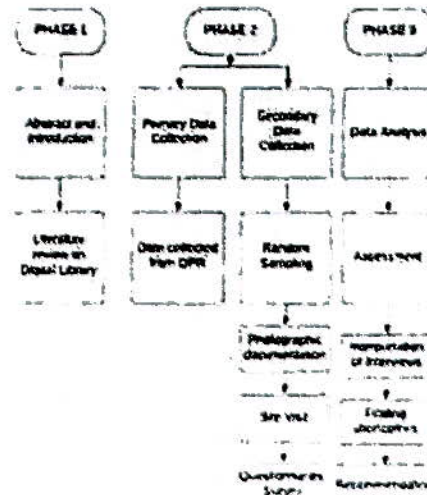


Figure 2.1: Research Methodology
Source: Author

design. The study will involve the analysis of the user activity and the outcomes of the Digital Library.

There were questionnaires prepared and interviews conducted with a group of people ranging in age from 25 to 35 who visited the Digital Library for their educational purposes. The Questionnaire for semi-structured interviews is covered in Annexure 1. The survey was conducted to find Digital Library user views, ideas, and suggestions. More specifically, the survey aims to identify, prioritize and manage the key issues and concerns affecting Digital Library.

2.2 Key features of the project

2.2.1 Challenges in the project

- Finding a suitable location for a Digital Library near the Tumakuru Central Library.
- Challenges in training library users.
- Conducting seamless public/student education sessions to explain the Tumakuru Digital Library.
- Adaptability to technology was always a challenge.
- The transition from a conventional to a technology-driven system.
- Collaboration with education institutions and organizations.

2.2.2 Risks involved in the project

- Issues related to cyber security and data protection.
- Recruiting and developing skilled workers, including in-house training for existing employees.
- Damage or repair of the computer may require financial assistance.
- Proper maintenance and operation of internet, cloud, and management services.

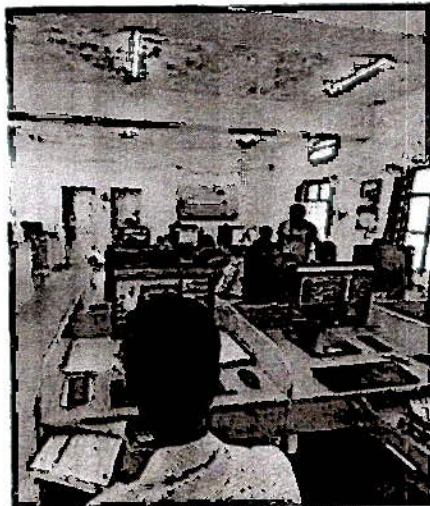


Figure 2.2: Digital Library Tumakuru
Source: Author

2.2.3 Features and Benefits

Features provided to Digital Library

- Relevant Hardware and Software provided to Tumakuru Central Library.
- 20 All-In-One Touch-Based Desktops in-housed for the Public Use.
- Free internet is facilitated within the Digital Library.
- For backup and security, electronic securities such as UPC and CCTV are used
- Web Portal for Tumakuru Central Library which can be accessed from anywhere and anytime.

Benefits of Digital Library

- Open access publications (e-Book, e-Journals, e-Patents, e-Magazines) are available on the e-Journal and e-Book platforms for free of cost.
- More students are visiting the site to view educational videos and e-resources.
- Digital Library enhances the in-house reading facility.
- Web-based and app-based remote access to subscribed users of the Digital Library.

2.3 Key findings from the interviews, surveys, and primary/secondary data collection

The key findings of the survey are the following:

- The majority of the users visiting the Digital Library are students preparing for competitive exams.
- The study shows that an increased number of male users were found compared to female users.
- From the day of launch, the number of subscriptions has increased
- Different types of content are used depending on the users.
- On analysis, it is found that over 76% of the

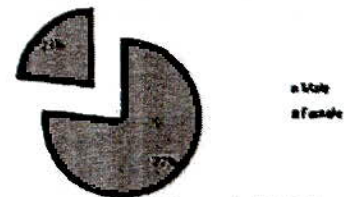


Figure 2.3: Gender ratio of visitors to the Digital Library
Source: Report by smart city officials

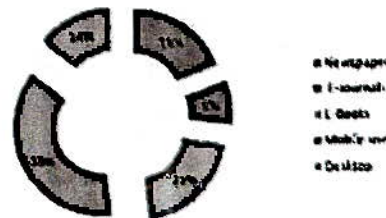


Figure 2.4. Content Accessed by different users in the Digital Library
Source: Report by smart city officials

registration is from Tumakuru along and more than 8000 readers from Karnataka. (Source (Tumakuru smart city limited. (2018). Detailed project report on Digital Library)).

- Students approximately around the age 24-34 visit the Library in a higher ratio compared to other group.

3. Discussion and Conclusion

3.1 Implication

Server for Digital Library:

The server can be accessed by visiting the url <https://tumakurudigitallibrary.in/> (Figure 4). The website contains more than 58,000 E-Books under Literature, Textbooks, Children's Books etc. [E-Books include Children's Books, History, Literature, Science and Technology, Geography, Religion etc.]. It also provides space for Blog writing, and access to different journals, newspapers, magazines and educational videos. Free internet is facilitated within the Digital Library.

It was found that the speed of the web portal gets lowered during website upgradation and the server sometime gets hanged during traffic on the website.

Safety and security:

Safety and security was the primary concern. An individual was assigned to check on users at regular intervals. The Library kept a proper registration book at the entrance to identify visitors. With the help of the registration book, damage and repairs to the computers were identified. Due to security reasons, bags and electronic devices, such as pen drives and USBs, were not permitted in the Library.

Physical infrastructure:

The room allocated to Digital Library is located on the first floor, neighboring the Tumakuru Central Library. The Library was furnished with 20 All-In-One Touch-Based Desktops.

A need for proper racks or shelves to store bags and shoes was found (Figure 6). The location of the Library is in the makeshift room, where infrastructure issues can be observed. The facility will be shifted to the new building - City Library being built by TSCL by 2022.

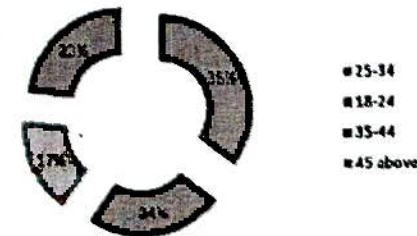


Figure 2.5: Age-wise distribution of Visitors to Digital Library
Source: Report by smart city officials

Impact on SDG:

SDG Number	Goal	Indicator	Remarks
4	Quality Education	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	DL provides access to different resources and e-content's improving educational quality.
8	Decent work and economic growth	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	Indirect positive impact on gaining knowledge and building a financial career
9	Industry, innovation and infrastructure	Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation	Openness to different disciplines helps in fostering the information on the particular fields

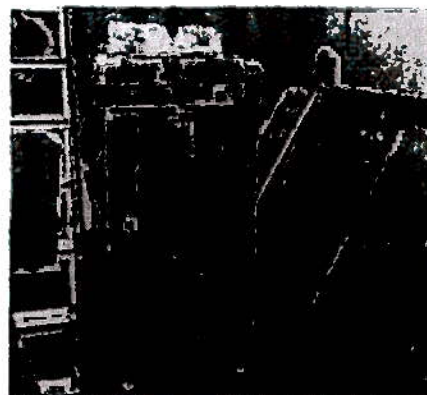
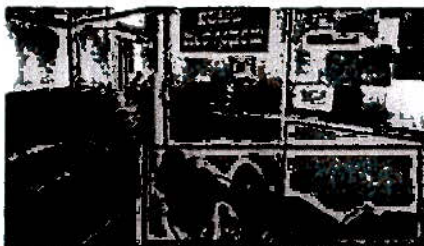


Figure 2.66 : 2.7 : Infrastructure for storage
Source: Author

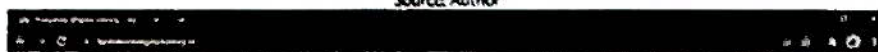


Figure 2.8 : Digital Library Website
Source: Webpage 2 (<https://tumakurudigitallibrary.in/>)

3.2 Limitations of the research

- The majority of the information gathered and broke down in this setting has been done on the subjective premise of information assortment. The organized interviews led (group of users) can't be projected as overviews to depict the evaluation on Digital Library.
- The opinions and data collected are from the limited number of site visits.

3.3 Key lessons learned

- Giving access to a digital library consumes a lot more time than going to a physical library.
- Digital libraries are comparatively cheaper than print libraries.
- As cost is concerned, resources available in the digital collection are more than in print libraries.
- Difficulties in maintenance and operation of both physical and social infrastructure of the Library.

3.4 Recommendation

Additional computers for the user, to save their waiting time.

Proper storage racks or shelves to place the user properties like bags or shoes.

Maintenance of physical infrastructure to avoid the complaints like stumoling of water.

Increase the speed of the website.

Providing proper access to physically challenged people and elderly people could increase their visits to the digital Library.

Provision for air conditioning, since there are numerous systems in one room.

An alternative source of power supply could be tapped in for example solar energy could be utilized to consume electricity.

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Webpages

- <https://en-academic.com/dic.nst/en/wik/11648458>
- <https://tumakurudigitallibrary.in/>

A29

Smart Education - Shivamogga

Name of the project: Smart Education
Location: Shivamogga
Year of Project Implementation: 2016
Sector: Education
SDG: Quality Education
Project Cost: ₹ 100 Lakhs

Institute: K. J. Somaiya Institute of Technology and Engineering
Advisors: K. J. Somaiya Institute of Technology and Engineering
Students: K. J. Somaiya Institute of Technology and Engineering

Keywords: Smart Education, Shivamogga, Quality Education, Smart Education

The study was based on a qualitative approach. The data was collected through a series of focus group discussions with teachers and students in a secondary school in South Africa. The data was analysed using a grounded theory approach. The findings of the study are discussed in terms of the implications for teacher education and the role of technology in the classroom. The study highlights the importance of teacher education in preparing teachers to use technology effectively in the classroom. It also identifies the need for a supportive environment for teachers to use technology in the classroom. The study concludes that teacher education should focus on developing teachers' pedagogical skills and their ability to use technology effectively in the classroom. It also recommends that the education system should provide a supportive environment for teachers to use technology in the classroom.

Abstract:

1. Introduction

The Ministry of Housing and Urban Affairs (MoHUA), Government of India (GoI) has rolled out the Smart Cities Mission on 25th June 2015. Shivamogga was selected under the second round of smart city mission among 100 cities to be developed as smart cities in India due to various achievements, initiatives, and all-inclusive approach. Accordingly, Shivamogga city had submitted a "Smart City Proposal" (SCP) to the Ministry with the required consent of the Karnataka government and statutory authority of Shivamogga Municipal Corporation.

1.1 Topic and Context

In view of the changes that society is undergoing because of globalization and the growth of new technologies, education is a critical component in the development of cities. Shivamogga's proposal incorporates smart city solutions, which involve the use of technology, information, and data to improve the city's infrastructure and services (Smart Solutions Projects). Shivamogga Smart City Limited (SSCL) plans to set up e-learning and smart classroom programs at government-run schools, in keeping with the smart city goal. Smart classrooms are based on the intersection of three axes that interact in the design and usage of the learning environment:

- The ergonomics and architectural design of the classroom.
- The integration of technology, particularly ICT, in a way that is useful, invisible, justifiable, and extensive.
- An innovative pedagogical methodology, appropriate to that space, that improves the efficiency and satisfaction of learning, and is based on teaching principles such as collaborative learning, project-

based learning, curricular globalization, student autonomy, educational co-responsibility, and so on.

Strengthening the education system plays a vital role in enabling long term sustainable goals. The Shivamogga district comprises a 17.52 Lakhs population, wherein the average literacy rate is 80.45%. While the average literacy rate of Shivamogga city is 87.78%. As per 2015-16 statistics, the pupil-teacher ratio was 19 in primary, 13 in higher primary, 16 in high school and 30 in senior secondary school. As per Student Achievement Tracking System, Karnataka (SATS) data, there are about 92 government-run educational institutions in Shivamogga Urban area which includes 18 schools providing primary schools, 62 schools providing higher primary education, 10 schools providing High school education and 2 are PU Colleges.

The smart education project is a Pan City project initiated in 2016 and completed in 2020. In Shivamogga, government-aided higher education schools have been identified to carry out the Smart Education Mission. Out of 68 government-aided schools in Shivamogga, this project is being executed in 45 schools. The total budget of the project is estimated as 15 crores. This project aims to provide ICT labs, Chromebooks, digital classrooms based on the no. of Pupils in the schools. It is estimated that each school will be allotted at least one Smart Classroom with Chromebooks in ICT Labs and one digital classroom. The stakeholders for this project are students, teachers, school management and the Educational Department. While efforts are made to find the impact of smart education on students, teachers and find the difference between traditional teaching and

smart teaching methods.

For both citizens and government, it is vital to have e-learning and smart classrooms in schools. For citizens (young citizens) these projects enable

- Better quality of education, and
- Wider reach of academics.

It is vital for the government to facilitate technological advancements such as e-learning and smart classrooms in order to ensure quality modern education reaches the young minds and in turn leads to sustainable development.

1.2 Significance of the Project

Smart classes enhance the learning experience with their resourceful, technology tools. It increases the facilities to students with easy access to online information, it enhances the interactive learning experience. Smart classes help teachers to deliver lectures more efficiently. It has digital boards, projectors, computers, LED screening facility, Internet Facilities, ICT Labs, etc. It Focuses on achieving the SGD Goal -04 - Quality Education. Smart classroom-based education was proposed through a four-track program.

1.3 Aim and Objectives

The aim of the study is to examine the impact of Smart Education in Government schools and develop a framework to evaluate the project and to further implement the smart education program in other government schools in Shivamogga.

The objectives of the study:

- To identify the facilities provided in the schools under the smart education mission.
- To identify the impact of digital education on stakeholders.
- To understand the views of stakeholders in digital classrooms, technology usages in the classroom.
- To identify the difference between traditional learning and smart learning and implement the techniques in other schools.

2. Contextual Background

Quality education for school children is an essential requisite in today's competitive world. Technology has impacted us in every aspect. Digital learning/classrooms are one such technological advancement in education. Digital learning refers to the application of digital technologies within learning, teaching and assessment practices in a school. These digital technologies are constantly evolving. Depending on the application of these technologies in classrooms or in teaching methodology, these classrooms are broadly

Smart Education through Smart Classroom

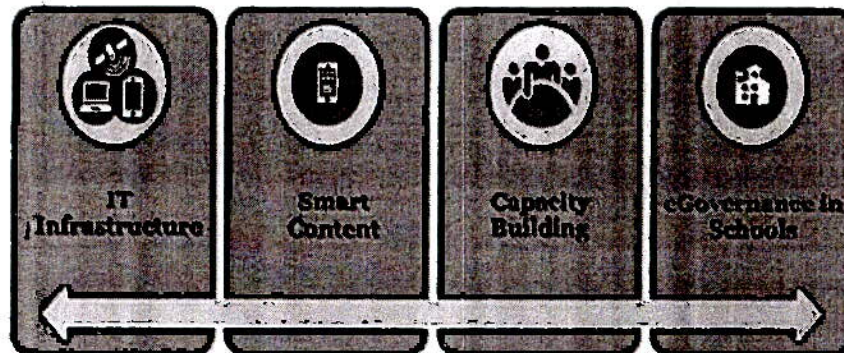


Figure 1.1: Smart Education Through Smart Classroom
Source: Final Detailed Project Report "Implementation Of Smart Education in Government Schools Of Shivamogga"

categorized as digital classrooms, smart classrooms, virtual classrooms, and future classrooms.

2.1 Conceptual Framework/Research Design

The framework for the project is as follows:

2.1.1 Introduction

The introduction will include the research question which is how smart classrooms improve the academic performance of the students and the summary of the proposal.

2.1.2 Literature review

Literature on the topic: Literature studies were done on Chandigarh and Uttar Pradesh smart classroom projects to understand the challenges faced during various stages of the project.

Literature on Method: Literature studies on method was done based on research papers to identify the framework for evaluating the classroom based on four dimensions and their annotations.

2.1.3 Methodology

2.1.3.1 Data collection

The data were collected through multiple sources including a primary survey, development of a questionnaire and analysis, interactions with Shivamogga Smart city Limited Office, school headmasters, and secondary research (central and state initiatives, flagship programs in e-learning and smart classrooms across the country, analysis of e-learning projects in other smart cities). We also carried out discussions with major stakeholders including teachers,

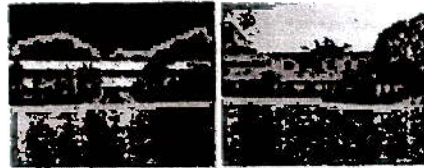


Figure 2.1: Government Higher Primary School, Durgigudi, Shivamogga

Availability of internet and computers at school hours
15 responses



Figure 2.2: Survey Findings - The Availability Of Internet And Computer At School Hours

students, and management to assess their primary and secondary needs.

2.1.3.2 Survey

The surveys (primary) were aimed at understanding the current status of digital learning/teaching through four dimensions and their annotations in Govt. Model HPS, English Medium, Durgigudi, Shivamogga.

2.1.4 Preliminary Findings

From the literature review and site study were analyzed and important categories and their relationships were identified. This included the features and benefits, risks involved and the challenges of the project.

2.1.5 Statement of limitations

Limitations to the research were identified to look into the alternatives and the weaknesses of the project.

2.1.6 Conclusions

Conclusion covers the key lessons learned and the recommendations for the project. The role of SDGs in smart education is also analyzed through the SDG impact assessment tool.

The questionnaire is included in Annexure 1 and Annexure 2

2.2 Key features of the project

The smart education project focuses on providing one smart classroom in every school.

- Interactive learning management system - This will have various modes. Simulation Mode, 3D Modeling

Figure 2.3: Indicating The Understanding Levels Of Students In Smart Classrooms.



Figure 2.3: Indicating The Understanding Levels Of Students In Smart Classrooms.

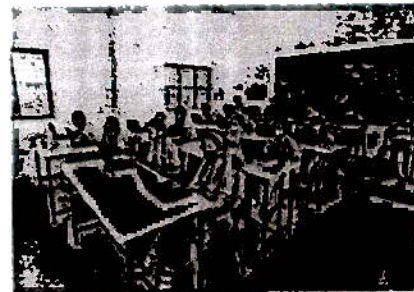


Figure 2.4: ICT LAB In Government Higher Primary School, Durgigudi, Shivamogga

and Animation, Drawing and Diagrammatic mode. Live and offline mode

- E-libraries- As part of e-library project taken up under smart cities, e-library infrastructure is being provided in 9 schools and 2 PU colleges.
- Studio option - The studio will help teachers and students to create content and record lectures that can be viewed later and also conduct live-streaming lectures.

2.2.1 Challenges in the project

- Lower enrolment rates in schools due to lack of basic amenities and infrastructure.
- The Digital and ICT facilities are limited.
- Lack of smart classrooms. Accessibility- the children in government schools do not have enough opportunity to learn to build concepts beyond the schools.
- Flexibility.
- Inefficiency - it's a challenging task for teachers to keep a tab on every child in the class, recognize current understanding levels and modify the content and delivery accordingly
- Training of tutors to understand this model.

2.2.2 Risks involved in the project

- Highly depends on ICT components such as the bandwidth of the internet, cloud services, and management services.
- The technology used in smart classes is expensive and complex.
- High maintenance costs are incurred.
- Security and safety issues.

How easily can you use chrome books or computers?
15 responses



Figure 2.5: Survey Findings - The Availability Of Internet And Computer At School Hours.

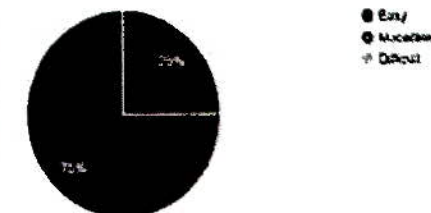


Figure 2.6: Access The New Equipment In Smart Classroom

2.2.3 Features and Benefits

- It increases the access to online resources for students.
- It improves teaching skills through digital awareness.
- It helps in the automatic streamlining of the activities in school.
- It improves students' skills.
- The quality of education has improved.

2.3 Key findings from the interviews, surveys, and primary/secondary data collection

Key findings from DPR of Smart Education - Shivamogga Smart City: Primary Data

- Proposed ICT Labs and Smart classrooms in government higher schools.
- Introduce smart education in classrooms through smart classrooms such as IT Infrastructure, Smart content development, capacity building, E-Governance scheme.
- Few schools have preliminary IT intervention which can be upgraded easily with few interventions.
- Digital content is provided by the Government of Karnataka. But due to a lack of basic infrastructure visual content could not be provided.
- Major challenges in schools are Teacher-student ratio, lack of basic infrastructure amenities, sanitation etc.

Key Findings from stakeholders based on the survey:

A survey was conducted in Government High School, Durgigudi, Shivamogga. Government high school, Durgigudi is one of the selected schools in the ABD area for implementing smart education programs. The total strength of the school is 919 members out of which 346 members are a high school. SchoolNet India is the service provider through K-Yan technology. This school consists of three smart classrooms and one ICT lab. The survey is conducted based on the framework for evaluating smart classrooms.

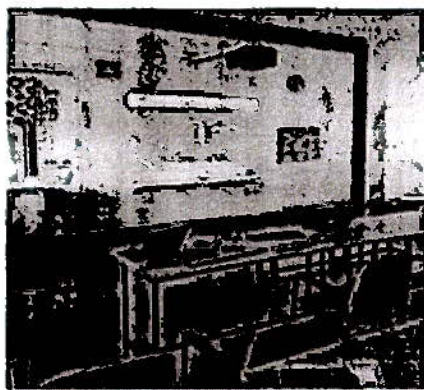


Figure 2.7: ICT Lab in Government Higher Primary School, Durgigudi, Shivamogga

Resources	The convenient level for accessing the internet and sharing digital resources etc.,
Enhancement	The level of facilitation of learning and teaching by using digital devices.
Management	The convenient level for conducting flexible pedagogies.
Presentation	The convenient level for presenting content and sharing learning outcomes.

A questionnaire is being produced as part of the survey to analyse the smart education project. In smart classrooms, it's critical to have a stable network. We discovered that the network was not disrupted and that all pupils were able to use the computers/desktops throughout school hours. The students acclimated to the new technology rapidly.

As shown in the graph, about 86 per cent of students can understand the subject taught in the new schooling techniques. Changes in the teaching approach were implemented, allowing students to improve their understanding. The student-teacher relationship has been developed.

A projector, stylus, and whiteboard are included in each smart classroom. Chromebooks are offered to pupils as part of the ICT labs. These books are used in class to view textbooks, share knowledge, and prepare presentations. The E-library, which includes textbooks, journals, and articles that can be read from anywhere, is available to all students through the portal. Since Chromebooks became a part of the ICT labs, everyone has had the opportunity to use them and become familiar with new educational technologies. Each smart classroom had a dedicated charging point for Chromebooks to be charged after schooling hours and are used during schooling hours.

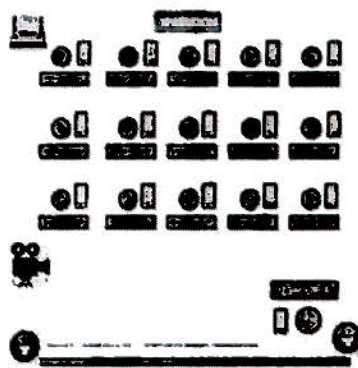


Figure 2.8: Example Of Smart Classroom Layout

Teachers were adequately trained on how to use the smart classroom. Even though the transition from blackboard and chalk to whiteboard and projector was completely new to them, they were able to adjust. As a result of the new teaching methods, they were able to make more informative presentations for pupils. This aided them in making the class sessions more participatory. Teachers have a modest level of adaptation to new technology in terms of controlling projectors, producing online content, and creating videos for presentations.

The graph depicts teachers' ability to adapt to technology in the classroom. Teachers had some difficulties at the beginning of the project because they were new to these technologies. They had difficulty preparing digital content, making videos, understanding the user interface, and uploading content material for students, despite the fact that they had received adequate training. These obstacles were subsequently alleviated as a result of regular school training sessions conducted to teachers and adaptation to new technologies.

"There is a hike in school admissions after implementing this project. The interest in students to learn new things, work on desktops, and innovative thinking has increased. They were very interested in digital classrooms which offer animated videos for their regular classes. The students were able to learn new technology much faster than us so they helped us in a few things in operating the digital classrooms. The only drawback is there is no supporting infrastructure such as a classroom that can accommodate full class strength." - Mrs Nusrat Jahan, Assistant Teacher

"There were no challenges while implementing the project. There was a positive response from all stakeholders as well. The teachers in the schools were given a training program on smart classrooms by SchoolNet India and a refresher programme is conducted every 6 months for teachers. The admission enrollment in Durgigudi school has climbed up; the students from other private schools joined this school

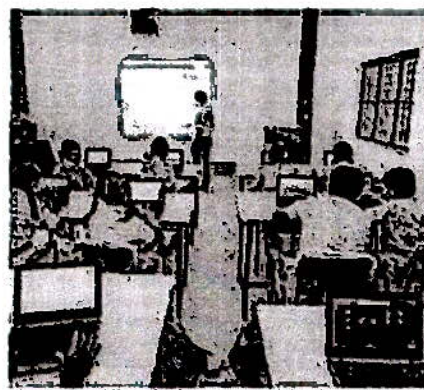


Figure 2.9: ICT Lab in Government Higher Primary School, Durgigudi, Shivamogga

after implementing this project. The dropouts from school have decreased. - Mr Pradeep Kumar B, Senior Urban Planner, SSCL.

3. Discussion and Conclusion

3.1 Implications

Impact assessment framework for sustainable development.

Smart education mission has a direct positive impact on achieving:

- Goal-04 - Quality education.
- Goal-05 - Gender Equality.
- Goal-09 - Industry, Innovation and Infrastructure.

Smart Education In Government School

The Smart Education Project contributes to the achievement of the Sustainable Development Goals because it has a positive influence on Purpose -04 Quality Education, which was the project's main goal. It also contributes to Goal05, gender equality, by providing equal opportunities to all people, regardless of gender, and educating society about gender equality. Because smart city development includes smart education, Goal -09- industry, innovation, and infrastructure have a positive impact because it concentrates on improving school infrastructure.

3.2 Limitations of the research

The findings of the study had to be seen in the light of some limitations:

- Limited access to secondary data.
- The project cannot be accessed from an economic point of view.

3.3 Key lessons learnt

The Smart Education project aimed to provide high-quality education to all children. Providing supportive infrastructure in schools, provided an opportunity for economically disadvantaged children to receive

a better education. When this is implemented in all government schools, the distinction between them in terms of education is gone. By providing E-Libraries, stakeholders would be able to access information from anywhere at any time.

However, the scope of the project can only be met in the long run the project is implemented on an experimental basis and will become fruitful if students are exposed more to the smart education curriculum

Smart classrooms are defined by the intersection of four axes:

- **Resource:** The convenient level for accessing the internet and sharing digital resources, etc
- **Enhancement:** The convenient level for accessing the internet and sharing digital resources, etc. and air condition
- **Management:** The convenient level for conducting flexible pedagogies
- **Presentation:** The convenient level for presenting content and sharing learning outcomes.

The project was assessed using these four parameters mentioned above and the key findings are:

- **Adequate training for teachers:** The adoption of technology in education has led to an unprecedented transformation from teacher-centric education towards student-centric education. Virtual classrooms and various online tools are helping to continue and enhance the engagement between the teacher and students as close to the classroom-type experience. Going forward, smart classrooms are making everything possible from teachers and parent meetings to staff/management meetings, providing the necessary interactivity therefore it is important to make teachers aware of the newer technology. The teachers were not aware of every possibility of the programme.
- **Adequate contact hours:** the students are now exposed to smart classrooms for only a few hours a week, and the remaining hours are spent in the

conventional classrooms. This is in contrast with the scope of the project. Even though the curriculum has changed the teaching methods remain the same

- **Adequate infrastructure:** the smart classroom sessions need to be conducted in a way that a whole class can attend the class at once. Infrastructure limitations led to the reduced effectiveness of smart classroom education, the strength of each class was 50 but the ITC lab capacity is 25 students.
- **Adequate funding:** the service charges are rising as the schools move forward with technology and are not included in smart city funds. Schools are burdened with service charges.

3.4 Recommendations

The classroom has to have a different shape in times to come. It is just like a laboratory where different hardware such as projector, tape recorder, recorder player, overhead projector, epidiascope, computer etc. are lying around. Different types of software are also available to improve the process of teaching-learning. Normal classrooms have turned into smart classrooms. To achieve this following recommendation are made

The smart classroom should be used in schools to make students aware of the optimum use of technology in their studies.

- The curriculum in all academic activities should be connected to the Smart Class. The teacher should make proper use of Smart Class to clarify the topic.
- The projects, seminars and home assignments, all should be given by taking digital learning into account. New concepts and up to date information should be given to students through the Smart class.
- The guidance of the teacher must be there with the student while using the smart class so that they do not get distracted from the right path.
- Seminars, conferences and workshops should be organized to provide the teachers with the updated knowledge of using technology (smart class) in the classroom so that they in turn are able to motivate their students for their success in academic achievement.
- Students should be given the proper instruction related to the topic before using the smart class and they should be about the benefits of using the smart class.

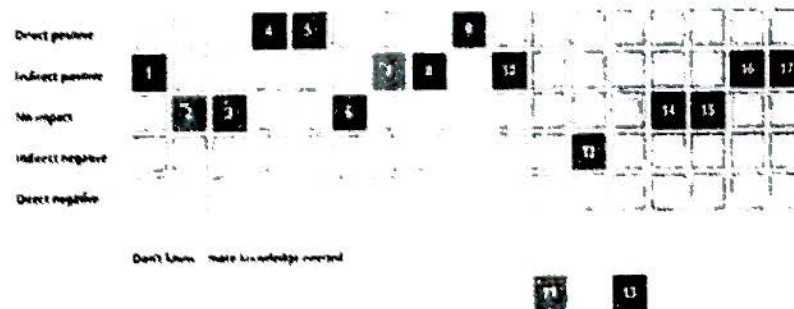


Figure 3.1: Impact Assessment of Sustainable development

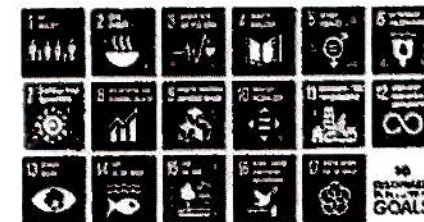


Figure 3.2: Sustainable Development Goals

A flexible structure adapted to users' needs, comfortable, with multiple resources, socially and digitally connective,

personalized, tidy, open to its immediate environment and the world, and finally, safe for its users and safe in its

technological equipment should all be considered in the design and implementation of a smart classroom.

Framework of Assessment

Variables/Parameter	Measuring Items
Resource The convenient level for accessing to the internet and sharing digital resources, etc	I can get on the internet to search for learning materials I can get on the internet I can share digital resources with peers I can get the videos that the teacher uses in class I can get digital learning resources. I can find that computer sockets in the classroom when I need to use them The Bandwidth of internet
Environment The convenient level for the indicators of the physical environment, like temperature and air condition The convenient level for the indicators of the physical environment, like temperature and air condition the convenient level for the indicators of physical environment like temperature and air conditioning, natural lighting in classes, libraries	Temperature in the classroom is suitable for concentrating on learning. I don't feel sleepy in the classroom because of the fresh air in the classroom. No unnecessary noises exist in the classroom. Light in the classroom is enough for reading books or digital books. I can hear teachers and other students clearly
Enhancement The level of facilitation of learning and teaching by using digital devices	I can get the correct answer for questions. I can get learning guidance from devices. I can work with peers for learning tasks. Teachers can assess my practice instantly. I can accomplish tasks by using devices.
Management The convenient level for conducting flexible pedagogies	I have an adequate workspace for the placement of textbooks, tablet PCs and other Resources. Adequate space exists for easy movement among workstations, resources and exits. The layout in the classroom is suitable for my ways of learning. The podium, blackboard and projector are at the right place for teaching and learning
Presentation The convenient level for presenting content and sharing learning outcome	I feel the digital devices promote my sharing. I understand teaching content better with the multi-screen display. I feel the network promote my sharing. I can share my learning outcomes with others
Infrastructure	Digital infrastructure in classrooms No. of smart classrooms per class Staff rooms for teachers Toilets Playgrounds Digital library Computer labs - ICT labs No of desktops

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A30

One City, One Center for All:
An assessment of the Integrated
Command and Control Center at
Mangalore

Name of the project	Integrated Command and Control Center at Mangalore
Location	Mangalore, Karnataka
Year of Project Implementation	2015-2016
Sector	Police
SPG	Police
Project Cost	₹ 100 Crores
Institute	Centre for Cyber Security, Government of India
Advisor	Centre for Cyber Security, Government of India
Student	Centre for Cyber Security, Government of India
Keyword	Integrated Command and Control Center, Mangalore, Karnataka

Abstract:

The Integrated Command and Control Centre (ICCC) was the main research project of the Mangalore Smart City Proposals. Karnataka Urban Infrastructure Development Finance Corporation Limited (KUIDFC) is the sponsor of the project and the responsibility of KUIDFC has proposed that the SMEs should be invited to bid for the ICCE from all seven cities. Integrated Command and Control Centre (ICCC) is the way forward for centralizing, structuring, and operating citywide services through the IoT (Internet of Things) and cloud computing. The ICCE will manage city infrastructure, public services, and financial management of the city. The project has focused on creating a central command and control centre for the government operations. The approach is infrastructure and service oriented. The project includes equipment, software, and services. The project was completed in 2015 and proved to be a very important step in the smart city implementation. The project is implemented in 7 cities (Bengaluru, Chennai, Hyderabad, Kolkata, Mumbai, New Delhi, and Pune). The project is completed for using of four packages: 1) Bangalore Smart City Transport Management System, Citywide for all the cities; 2) Chennai Smart City Transport Management System, Citywide for all the cities; 3) Mumbai Smart City Transport Management System, Citywide for all the cities; 4) Pune Smart City Transport Management System, Citywide for all the cities. All the packages are active with their benefits to the city and to the people. The second phase is ongoing, focusing on the smart city management (Smart City Transport Management System).

In this research, the focus is on understanding the ICCE, the data collection to SDGs, and identifying data gaps. The data collected are: 1) the data collected from assessments such as ICCC maturity assessment, smart city maturity assessment, and smart city maturity assessment; 2) the data collected from smart city maturity assessment; 3) the data collected from smart city maturity assessment; 4) the data collected from smart city maturity assessment. Through the research, some recommendations have been included in the research report.

Case Study: A30

1. Introduction

1.1 Topic and Context

The ICCC is a part of Smart City Proposals by Mangalore Smart City Pvt Ltd under the Smart City Mission Initiative by the Government of India. ICCC is a "Pan City" project and is being developed in three stages-Design & Development Phase, Project Facilitation & Implementation Phase, and Operations & Maintenance Phase. This is a "smart governance and administration" project which aims at Smart Governance through the IoT² model. The ease of access to public services and efficient coordination of the infrastructural network are key objectives of developing a command center. The infrastructure network includes Governance, Healthcare, Transport networks, Surveillance, Connectivity (Virtual), Energy systems, Disaster management, and Security infrastructure¹.

The project is located in MG Road, Lalbagh, Mangaluru, Karnataka. Mangaluru has become one of the first cities in India to implement the command and control center completely. Evident from the war room created during the COVID19 Pandemic helped the agencies monitor the situation and address issues from the residents. The ICCC went online after Chief Secretary

Shri T M Vijay Bhaskar, Chief Secretary of Karnataka, Smart City Mission Director Shri Charulata Somal, and Shri. Nazeer, Managing Director, MSCL, who visited ICCC and inspected the live applications, "expressed confidence that the entire project can be operational within next two to three months" (Mangaluru Smart City command control centre has gone live, 2020). Although the construction is proposed to be finished by May 2022, the Center is already functional. The ICCC was integrated with the Mangaluru City Corporation building. The residents being the main stakeholders as they are the ones who are going to get benefitted the most have already witnessed the efficiency of the System during COVID19.

1.2 Significance of the Project

Integrated Command and Control center becomes the most vital part of the Smart City Mission for any city as it controls and monitors most of the other "smart infrastructure" installations. The ICCC becomes a unified system through which major components of a city's infrastructure and Governance can be managed through technology, all under one roof. For a city like Mangaluru, this becomes crucial to monitor and maintain its other smart city initiatives such as Smart Market, Smart Roads, Smart Parking, etc. This Center will help residents ease

access to public services and infrastructure. It also helps in simplifying issues addressed in the process for the residents. Safety, one of the major concerns in any big city, is also a part of the system under the CCTV surveillance network. The Disaster Management & Emergency Response section, which got activated during the Pandemic, has helped the residents get a telemedical response and related instructions, hospital bed allocation, and even food arrangements in case various NGOs manage food supplies for migrant workers. The cell is active and can manage any disaster as per the ICCC framework. (Mangaluru becomes data-driven with Integrated Command Control Centre, 2021). The Smart City aims to manage disasters and responses through live tracking emergency response vehicles. This Center acts as a gateway between administration and citizens, where citizens can get access to help and address grievances. The Municipal Corporation also enjoys many benefits of having an ICCC in the city as it takes care of infrastructure management and brings about smart interventions to the problems faced by the citizens and the administration.

1.3 Aim and Objectives

This research aims to understand the functioning of the ICCC framework in the real world and critically analyze



Figure 1 Karnataka
(Source: Map created in GIS Software)

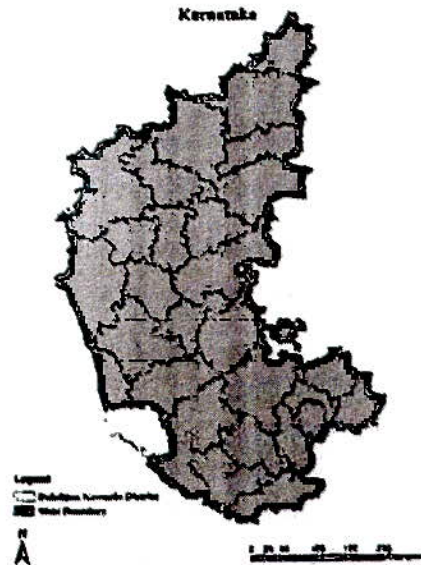


Figure 2 Dakshina Kannada district in Karnataka
(Source: Map created in GIS Software)



Figure 3 Mangaluru City
(Source: Map created in GIS Software)

the impact of this project on residents and the city's Governance and Infrastructural needs.

Objectives-

- To understand the functioning of ICCC and its correlation with other projects under the smart city mission.
- To study the impact of the project through stakeholders
- To analyze the adherence to Sustainable Development Goals(SDGs)
- To identify issues and gaps in implementation, if any, and provide recommendations.

2. Contextual Background

Mangaluru holds great significance for the state of Karnataka, along with Bangalore and other major cities. It is one of the major port cities in the country and the only city in Karnataka to have all four modes of transport -air, road, rail, and sea. Mangaluru is an administrative capital apart from being an industrial, commercial, and start-up hub. The city has the administrative headquarters of the Dakshina Kannada district. It is also the only Indian city to be ranked in the top 50 livable cities globally (Quality of Life Index by City 2017, 2017). Due to these and other such factors, Mangaluru has become one of the most important Smart Cities for the KUIDFC. In terms of smart infrastructure management. It acts as a tool for the government to control pan-city infrastructure and monitor everything under its jurisdiction.



Figure 4 ICCC was integrated into the MCC building at Lalbaug (Source: Map created in GIS Software)

2.1 Conceptual Framework/Research Design

The project has been divided into three major phases: Design & Development Phase, Project Facilitation & Implementation Phase, and Operations & Maintenance Phase as per DPR.

Phase one focuses on the Architectural design and development of the project. This phase also includes designing and developing One Touch Mangaluru Projects, City Wide CCTV surveillance, IT connectivity, and supporting infrastructure. This is followed by formulating the hierarchy and dependency network of various components. (Berger, 2018) The First Phase of the project was in 2019, with the following systems incorporated -

- Intelligent Transport Management only Vehicle Tracking System
- Solid Waste Management system
- Smart poles (15)
- Air Quality Sensors(5)
- DMER (Disaster Management and Emergency Response System)
- UMS(Unified Messaging System)
- One-Touch Mangalore (web app is online)

The second phase is the Project Facilitation & Implementation Phase. In this phase of the project, selecting a System Integrator takes place. The requirements for SI are laid down, and a project plan is formulated. This phase mainly focuses on strategy building for Integrating Smart city projects with the ICCC and laying down various standards and procedures for the same. This also builds up the basic System infrastructural requirements(majority IT) (Berger, 2018).

The Third Phase is the Operations & Maintenance Phase. This is the phase where the ICCC starts operating (goes live). As per reports, the ICCC became functional during the Pandemic in 2020. This operational phase activates the management and administration section,

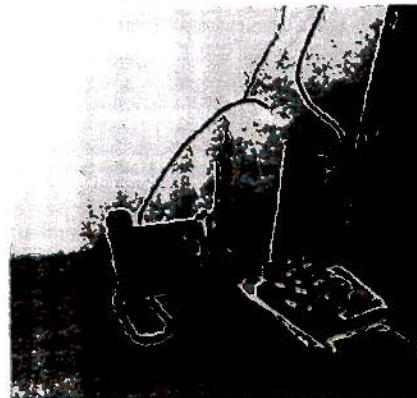


Figure 5 Hotline (Source: Authors)

and monthly reports are also generated (Berger, 2018)

Research Design

This research aims to understand the functioning of the ICCC framework in the real world and critically analyze the impact of this project on residents and the city's Governance and infrastructural needs. For this, the research methodology is as follows

Collection of Data- Primary Sources-

- Site visit- Major points focused-
- Architectural Design and observation of the functioning of the Department
- Interview with authorities- including questionnaire

Secondary sources-

- Detail Project report - Mangalore Smart City
- Articles and blogs for the study of public feedback and awareness
- ICCC maturity assessment framework and toolkit
- Sustainable development goals impact the assessment toolkit.
- Analysis of data

The data collected has been analyzed to understand the functioning, benefits for the users /administration, and various issues in initiatives under ICCC. The Sustainable Development Goals are assessed using the SDG assessment toolkit to understand which goals ICCC adheres to.

2.2 Key features of the project

- The project is one whole system that becomes the platform for the seamless flow of information between various infrastructural bodies and other public services to produce smart solutions.
- Business intelligence and data analysis refer to all the methods, technologies, and strategies used to interpret, analyze, and draw inferences from the data collected.



Figure 6 Space for 20 staff members (Source: Authors)

- GIS integration- The GIS is integrated with ICCC to achieve better management of IoT as they can now be geolocated. This would help in identifying locations for certain infrastructural works like where can be the waste dumped sustainably, placement of environmental sensors, etc
- SDGs – The project correlates to many SDGs, majorly Goal 11-Sustainable cities and communities, including Urban Governance.
- The Center has round-the-clock surveillance through CCTV cameras, which record the footage 24/7.

2.2.1 Challenges in the project

- Multiple systems across the city have to be integrated with ICCC to provide the required data for analytics.
- Data management is tough as the data is of varied sizes, types, and uses. The data acquired from road surveillance is a huge amount of data due to living feed compared to data from environmental sensors that are fixed, such as AQL.
- Managing various vendors with different contract durations is a hectic process and causes delays.
- The ICCC must be in line with all the departments, which causes multiple connection points that can become a point of failure.
- Extensive operations such as long-term data storage, round-the-clock surveillance, and then data analysis require robust architecture design and can sustain ICCC for a long time without changing the layout.

- Many systems exist in silos, and integration of them is a very big challenge for the management.
- Component failure may lead to data loss as the backend system could have the DR infrastructure support, but the distributed wireless sensors might not have the ability to store a large amount of data.
- Multiple citizens' connections in peak hours with ICCC and DC might lead to server overload.
- Dependency on GPS tracking devices for Intelligent Transport Systems.
- Due to the complexity of the systems, highly skilled staff is required.

2.2.2 Risks involved in the project

- The mismatch between the duration of contracts between Smart City and vendors can cause errors and delays in the implementation.
- There is no integration with 102, 108, etc., hotlines with ICCC, so the data collection will render useless if this integration does not happen in the future.
- Due to lack of full control, certain systems like the GPS-enabled bus system might fail because the driver can switch off the GPS.
- The central government's circular on selection criteria of vendors, which does not focus on QCBS* might lead to poor quality of work or delays.
- There are a few single-point failures, such as dependency on GPS for ITMS.

2.2.3 Features and Benefits (social, technical, city administration level, impact on environment and economy) to the city (expected and observed)

- Features & Benefits through the establishment of the Center.
- Centralized Governance, one Center to control all the physical infrastructure in the city
- Issues addressal
- Ease of access to Public services
- Security and safety through Surveillance (CCTV Monitoring)
- Disaster and emergency response mechanism (Recent use – COVID-19 Pandemic)
- Sustainable development (adherence to SDGs)
- Environmental analysis-AQL, Advisory

Features & Benefits through the functioning of the Center (Use cases)

- Alert generation and the automatic dispatch would trigger an immediate response to an incident. UMS is also used for awareness creation.
- System management through IT with fail-safe features to ensure availability of Smart city features at all times.
- Integrating Intelligent Transport Management System (ITMS) would provide easy access to public transport.
- Round-the-clock surveillance with real-time analysis.

2.3 Key findings from the interviews, surveys, and primary/secondary data collection

As stated above in the research design, the primary sources of data were site visits, interviews, questionnaires, and observations

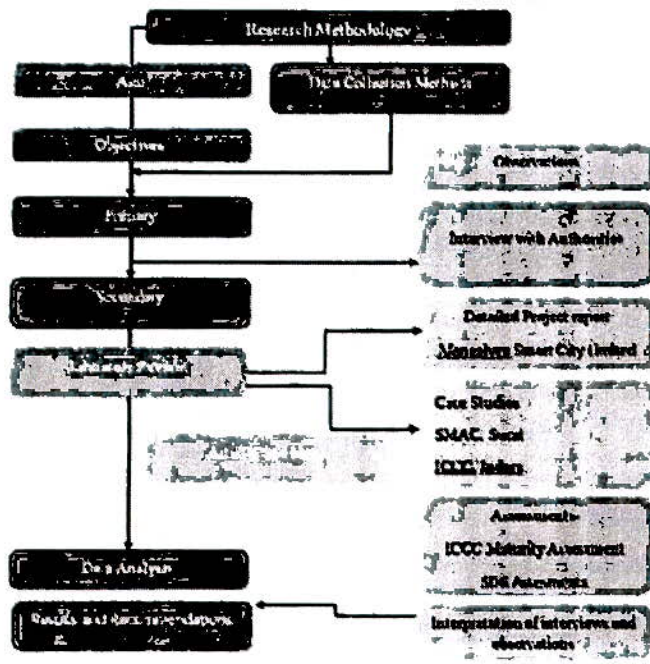


Figure 7 Research Methodology (Source: Authors)

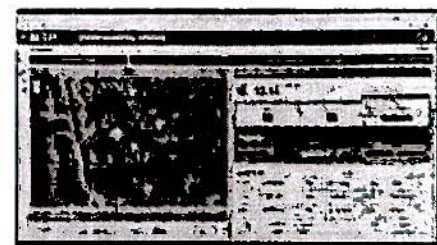


Figure 8 Environmental sensor data on the display wall (Source: Authors)



Figure 9 Bus tracking system on 1 Touchmangaluru website (Source: Authors)

Key findings from semi-structured interviews with smart city officials

Refer to Annexure 1 for a full interview

From the interview with Mr. Manoranjan Rao (Deputy General manager, Mangalore Smart city Ltd), the ICCC has already become a vital component of the city's infrastructure management. The functioning of ICCC is very systematic in terms of efficiency, response, and security. The ICCC played a major role in handling the crisis response mechanism during the COVID-19 Pandemic. It served as the central base of operations. It handled all the emergency responses such as ambulance, COVID hotline, Hospital bed allocation, Travel permits, etc. It also accommodated the police officers, medical staff, and others during the Pandemic.

According to Mr. Manoranjan Rao, The first phase of the project was completed in 2019. The second phase is ongoing.

The ICCC has four packages-

- Solid Waste Management
- ITMS-Intelligent Transport Management System
- Surveillance
- Disaster management and emergency response system

In addition to this- UMS (Unified Management System)



Figure 10 ICCC, Mangalore Smart City office (Source Authors)

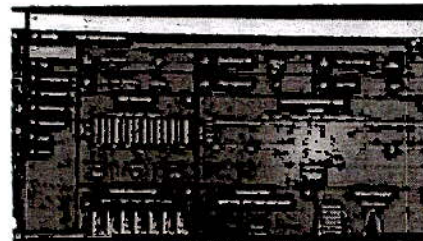


Figure 11 SWM live (Source Authors)

Solid Waste Management System

The SWM is done in a very innovative way. Around 90,000 houses are equipped with QR codes along with the collection vans.

The garbage collector is supposed to scan the codes after collection, which is then updated in the system and is visible on the monitor at ICCC. The collectors are compensated based on weight and kilometers traveled.

The residents can also scan their QR codes if their garbage was not picked up, but this is yet not available as the app is not released to the public. The application is ready for the android platform but not for IOS (iPhone).

Observations-

The software, hardware, and infrastructural components are given to various vendors with different contract durations, making the functioning difficult.

The display wall shows ample information for authorities to take quick action.

Key Benefits for the citizens -

- Systematic way of garbage collection
- Grievance addressal from anywhere through application

Key Benefits for Municipal Corporation -

- Intelligent monitoring of waste collection
- Easy tracking and grievance addressal

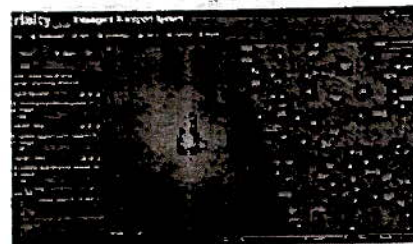


Figure 12 The ITMS screen showing bus locations on the left window (Source Authors)

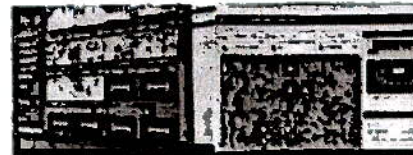


Figure 13 Surveillance footage -Live stream from the CCTVs at junctions and smart poles with PTZ cameras (Source Authors)

Issues-

- The workers are hesitant about the scanning system as it is additional work.
- The workers do not go to every house to collect garbage, or they do not scan the codes
- The Mangalore City Corporation owns these vans. When they go out of the corporation limit, they are assigned a supervisor, but that data is not shared with ICCC

ITMS (Intelligent Traffic Management System)

Mr. Manoranjan explains that the basic aim of this system is to help people plan their trips better. The ITMS is currently only applicable to city buses. This works on the principle of PIS (Public Information System) and monitoring. The entire journey of the bus can be monitored through GPS.

There are two types of data in this - One is user data, and the other is data for authorities. User data includes only vital information for a user to plan his travel, such as time of arrival, next bus 6, etc. Whereas for the authorities, it provides all monitoring data.

Observations-

The section on the display wall shows all the information pertaining to the driver's location, along with alerts and reports about their trips.

As explained by the officials, there are currently 285 buses equipped with GPS, but only 150 are connected as the bus driver has the option to turn it off.

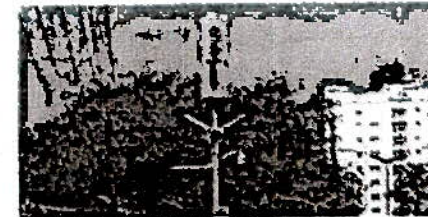


Figure 14 Smart Pole with 4 fixed focal length cameras, one PTZ, and a digital screen showing information related to AQI (Source Dajiworld Media Network - Mangaluru, SP)



Figure 15 DMER screen showing the number of emergency response vehicles and the total number of disasters (Source Authors)

The PIS information is displayed on only smart bus stops and the Chalo app.

Key Benefits for the citizens -

- Ease of making their travel plan as they can see the next bus, arrival time, travel distance, and time.
- PIS - users will be able to see which is the next bus, and what is the estimated time of arrival, origin, and destination. By knowing this, citizens would be able to choose an alternative mode of transport if necessary.

Key Benefits for Municipal Corporation -

- GPS-enabled tracking system helps the authorities know if the driver has changed course, monitor the driving, and alert traffic police in case of violation, rash driving, or any accident.
- Since the users can book a ticket through the Chalo app, it becomes easier for authorities to track real-time transactions centrally, the number of trips, the required number of buses, and the study of origin and destination for future planning.

Issues-

- The bus drivers can see other bus drivers' locations through which they try to delay other drivers. The drivers switch off the GPS.
- The Smart bus stop vendors and Smart city do not match the contract duration.
- The app from Mangalore Smart City Ltd is not yet released to the public.

Surveillance

The lanes were developed specifically for residential and The surveillance system includes monitoring traffic and citizens through CCTVs across the city. According to Mr. Manoranjan Rao- Surveillance is mainly focused on crowd management. Crowd management focuses on monitoring the order during a major event, or large public gathering. There are around 15 Smart Poles equipped with four cameras, each of fixed focal length and one PTZ (pan, tilt & zoom) camera. The city police use this extensively for crime detection, inappropriate behavior in public places, etc.

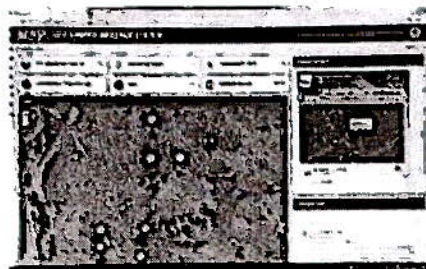


Figure 16 JMS screen showing the location of smart poles and live messages on various social media handles (Source Authors)

In the figure below live stream from the CCTV cameras is shown on the display wall. The staff also showed live tracking through PTZ cameras with 360 rotation.

Observations-

- Surveillance is very efficient in monitoring the public, crime detection has also taken place, and theft cases have been solved by tracking the movement of the culprit.
- The display quality of the fixed, as well as the PTZ cameras is very good as most of the required information to track a vehicle or a person is visible.
- Data Sharing- According to Mr. Manoranjan Rao all the data, including the live feed, is shared with the city police. The footage from cameras is not shared with the public at any cost, only with police and on court order.

Key Benefits for the citizens -

- Faster response - In case of theft or any mishap, the citizens can file a complaint with the police; the police can directly use either stored or live feed from the cameras to address the issue faster.
- Sense of safety - A person feels safe in a controlled environment (What factors are linked to people feeling safe?, 2020).

Key Benefits for authorities -

- The most benefitted agencies would be the Traffic

police and the police department of the city as they can live track every movement in the city.

- The real-time feed gives police the ability to take immediate reaction such as alerting nearby police chowki or even other agencies such as Quick response force, etc.
- Facts can be verified through footage in case of a claim in courts.

Issues-

- According to Mr. Manoranjan currently, there are no ANPR Automatic Number Plate Recognition, Red Light Violation Detection (RLVD), and Speed Violation Detection (SVD) Systems in place, so all the monitoring is done manually.

Disaster management and emergency response system

This cell played a major role during the COVID 19 Pandemic. The ICCC went online in 2019. This cell was the central base of operations for COVID response and has functioned well. The cell is also responsible for responding to any other disaster or mishap as well.

Observations-The DMER section on the display wall shows the locations and status of all the emergency response vehicles. Through an interactive menu, the staff member can easily monitor the vehicle and alert a nearby vehicle to respond to the disaster.

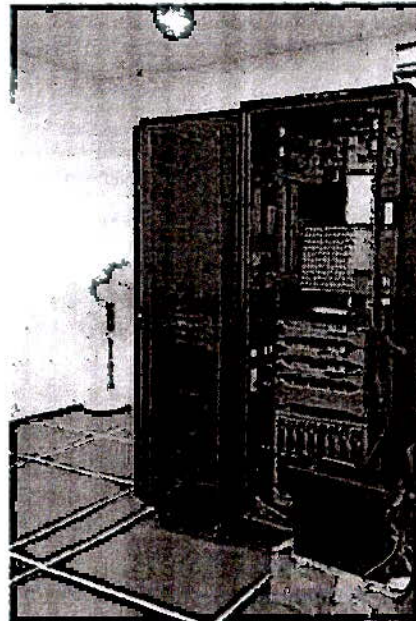


Figure 17 Server Room (Source Authors)



Figure 18 Biometrics Control Entry (Source authors)

Key benefits to the users

- Quick response to distress calls
- Monitoring various environmental attributes helps in issuing an early warning to the citizens.

Key benefits to the Authorities

- One-stop management of the emergency response mechanism.
- Alerts can be sent through UMS about a disaster
- DMER can track all the tickets till they are not solved

Issues- As explained by Mr. Manoranjan Rao, The DC office has shifted their operations here during COVID, 1077 hotline was here, but now they have moved back to the DC office. There are many features like ambulance tracking, hospital bed allocation, and fire tender tracking, but the data from 108, and 102 hotlines are not shared with ICCC; hence this data is not being utilized.

UMS Unified Messaging System

This is a mass alert/warning system in which a text message or a popup is sent to mobile devices by the government to warn against a disaster, sudden change in rules, or curfews. This system was extensively used during COVID for sending out RTPCR test appointments, Curfew timings, Vaccination appointments, and bed allocation.

- The key benefit for users is that they do not have to seek basic information from secondary sources about



Figure 19 SMAC, Surat
(Source: Surat Smart City)

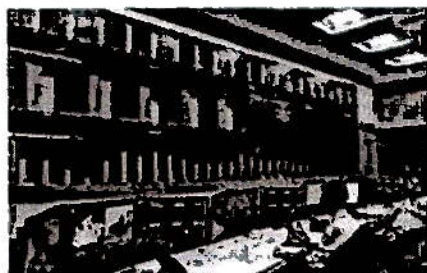


Figure 20 Indore ICCC
(Source: Times of India)

- a disaster or any orders issued by the government, they can simply receive a message through UMS.
- The key benefit for authorities is that they can issue warnings, alerts, or messages across multiple platforms to reach citizens.

Issues: There is a disagreement between authorities regarding financial factors as none of the bodies (DC office, MCC and ICCC) has a provision or protocol for this

Data management and security

All the data is currently stored in the servers present at ICCC. The management follows an open data policy, so all the data is available to the public except CCTV footage data.

For all the four packages, there are separate vendors for software & hardware development and installation. This causes data to be fragmented and might cause errors. The management will shift this Data to ICOP (Integrated City Operation Platform), which is a front-end application.

The authorities can see all the data for seven cities at one central location, ICOP. The KMDS will host all the data, this will be a soft migration of data.

Observations-

The main aim is to make data available at a common interface. This also increases data safety and reduces the risk of data loss as KMDS will use a cloud-based server. Data redundancy and data centers are also in place for the same.

The PCs utilized by the staff (20) all have disabled USB ports to prevent data theft except five, which are help desk PCs. According to the official, there has been no hacking attempt because the data does not hold any commercial value.

To prevent hacking, there are multiple firewalls installed and regular inspection is also done.

Public Participation

According to the official, the people don't understand ICCC because of its complexity for a layman. They do not show interest in learning about it. The public has been invited many times, but no significant input was observed.

The next step to increase public participation would be through feedback from the apps which are not yet released to the public. Reasons being political pressure, the app is only available for one platform, etc.

Key findings through case studies

SMAC, Surat and ICCC, Indore

The Smart City Centre is an Integrated Command and Control Centre launched in June 2016. The centre has been operational since then. The ICCC at Indore was completed only in seven months, and Indore became the fifth city to have a functional Command and control centre.

The centre collects all the information from various departments and sends it to the Surat Municipal Corporation for decision making. Automated sensors and other systems send data to ICCC for analysis and real-time tracking. It provides a centralized approach toward disaster management as well, and all the departments are connected to ICCC. Both projects work similarly to the ICCC at Mangalore, with differences being in terms of implementation. There are a few systems that are yet to be incorporated in the Mangalore ICCC such as Water Treatment Plant (WTP) SCADA Sewage Treatment Plant (STP) SCADA, Citizen Grievances and Redressal System, Property & Water tax (both SMAC and ICCC already have these operational), Automatic vehicle location system (AVLS) and Automated Fare Collection System (AFCS) (operational in Indore ICCC).

SWM - the Indore ICCC has more tracking and monitoring functions.

Results and Impacts-Round the clock surveillance and monitoring of the city help in crime detection, safety, management, and maintaining infrastructure efficiency.



Figure 21 SDG Assessment: Toolkit results

When all the functional information comes to a common platform, it becomes easier and more efficient to make decisions than the earlier practice of requesting different information from multiple departments. (Surat bags overall best smart city award, 2020).

3. Discussion and Conclusion

3.1 Implications

ICCC maturity assessment framework (ICCC Maturity Assessment Framework and Toolkit, 2018)

- Based on three aspects-
- Functional
- Technology
- Governance

Refer to Annexure 2 for a full assessment

Results-74.39 % Maturity rating (overall)

Functional maturity-81.82%

This assessment shows how functional is ICCC in terms of management of services provided by the ICCC and by the city. It also focuses on Transport management, Disaster response, safety and security, and convergence of these aspects.

81.82% is a high score which suggests the ICCC is functioning well in the above parameters.

Technological maturity-84.21%

This assessment provides results about the methods, technology, and equipment used for making the ICCC functional. This includes assessing hardware and software capabilities, for instance, data analytics, data storage, sensor data, etc.

84.21% is again a high score similar to the functional maturity assessment, as the Center cannot function without having good technological support or framework.

Governance maturity-57.14%

This assessment covers the governance framework, which includes working for staff, various policies, and SOPs. Without a well-structured framework, the ICCC won't be able to work to its full potential regardless of the technology available.

50% is a very low score as compared to the two above. The major issue is jurisdiction and ownership, for instance, the garbage vans are owned by MCC, but ICCC does the management. The ICCC does not have all the decision-making powers. It has to go through DC's and MCC's offices. There are different vendors with different contract duration, and also the current team managing the ICCC is there only for one year.

SDGs(Sustainable Development Goals)

The sustainable development goals are assessed by using the SDG impact assessment toolkit (Sustainable, 2022) The result comprises five types of relations-Direct positive, Indirect positive, and no impact, Indirect negative, and direct negative. (Source (Sustainable, 2022))

SDGs Identified are

Direct positive:3,9,11,13,16
Indirect positive:5,6,8
No impact:1,2,4,7,10,12,14,15

Table 1 SDG: Goal assessment

SDG Goal	Impact
Direct Positives	
Goal 3- Good health and Wellbeing	Through the use of UMS, citizens can be alerted. The ICCC worked efficiently during the Pandemic (COVID 19) as a backbone for the city administration to provide emergency response.
Goal 9- Industry, Innovation, and Infrastructure	There is extensive use of technology, for instance, the use of QR codes for scanning in SWM, Smart poles, Smart bus stops, etc. The development of ITMS for City buses is another innovative way to ease the access to public transport.
Goal 11- Sustainable Cities and Communities	The ICCC aims to monitor the environment through various sensors like AQI, Temperatures, Storm warning systems, etc. Through ITMS, sustainable and efficient transport is planned. The city-wide surveillance system helps in reducing crime and also improves crime detection. All the information regarding emergency response during a disaster is available at the Center, such as the location of fire tenders, and ambulances.
Goal 13- Climate Action	The Center is focused on reducing the impact of human activities on the environment through the Smart City mission.
Goal 16- Peace, Justice, and Strong Institutions	The ICCC hosts all the live feed from the CCTV cameras and also shares it with the police department. There are traffic police constables present in the ICCC for regular monitoring and issue of challans. The police were able to use the surveillance system to solve cases and monitor major events.
Indirect Positives	
Goal 5- Gender Equality	Through ICCC there is no provision as of now but they have planned to integrate police patrolling vans to ensure women's safety.
Goal 6- Clean Water and Sanitation	The ICCC hosts the Municipal water management system data

SDG Goal	Impact
Goal 8-Decent Work and Economic Growth	There is a training and internship facility available at ICCC

Source-SDG assessment toolkit (Sustainable, 2022)

3.2 Limitations of the research

- This research is limited to understanding the functioning of the ICCC
- Quantitative surveys based on daily or weekly activity mapping are beyond this research's scope.
- Public surveys and questionnaires are not included. Only the authorities' interviews are included as the app is not available to the public for feedback.

3.3 Key lessons learned

- An ICCC is an important component of the Smart City Mission for all 100 cities. It provides a common platform for various systems that run the city.
- One of the most crucial parts of the functioning mechanism for ICCC is coordination with governance bodies. In the case of Mangalore, there is a very good relationship between MCC & Mangalore Smart City Ltd, which enables the Smart city to develop the projects smoothly.
- A holistic approach is the best approach when it comes to city infrastructural needs. All aspects should be covered like the Transit system, Safety, and Security, and waste management. These should be centrally controlled for smooth operations and monitoring.
- A city can be very efficiently maintained via the ICCC as it proved to be a backbone in terms of management for all the operations of various civic bodies across the city during the Pandemic.
- Through ICCC, an immediate response can be generated to any disaster or mishap in the city as all the departments are interconnected. Maximizing the use of technology such as UMS is very important in creating awareness, guiding citizens properly & providing necessary services. Through round the clock monitoring, a city can become safe and disciplined in very less time, as evident from the reduction in the number of challans issued during the beginning and today(300 per day to 100-150 today)
- ICCC, combined with MCC or any municipal corporation, in general, can make citizens' lives easier. For citizens, services such as Smart Bus stops with PIS, SWM with QR codes, Grievances addressal through the application, etc., make ICCC the support mechanism for the municipal Corporation to carry out its functions more precisely and efficiently.

3.4 Recommendations

Award of tender

Quality cum Cost-Based Selection (QCBS) – Evaluation based on the cost committed by the bidder and the technical qualification of the bidder. This method should be focused more on ensuring the quality of service and products and reducing completion time.

SWM-

- There should be a method such as a levy or penalty on either the garbage collector or the vendor for not scanning the QR code or not collecting the garbage.
- At least one member from Municipal Corporation should be present to monitor or advise on the functioning.
- There should be an awareness campaign done before the release of the app to make citizens aware of the initiative.
- There should be full public disclosure about how the QR codes are safe and would not lead to addressing tracing by a third party.
- The dump yards can be further used for the development of recreational parks

ITMS

- The contract duration of the vendor should match Smart City's duration.
- There should be a fail-safe procedure if a bus driver turns off the GPS unexpectedly. For instance, as the driver can turn it off, there should be a supervisor who can call up and ask the reason. Another way would be to block the option of turning it off altogether.
- There can also be a similar initiative towards Auto rickshaws or local taxis.

Disaster Management and emergency response

- There has to be an integration between the DC office and ICCC. ICCC's disaster cell has useful information that can prove vital during a crisis.
- Integration of various hotlines such as 100, 108, 1077, etc., should be done with ICCC as its Center. This can be combined with UMS, which will help control the response faster as it will become a centralized process.

For Phase 2

- The state and central government should provide clear financial protocols for projects which involve Smart City and Municipal Corporations.
- The QCBS should be the way forward for awarding projects
- Feedback from the public should be considered with utmost importance and for that, the Applications should have a feedback form/section, Annexure 1

Assessments and parameters

Table 2 Assessments

Integrated Command and Control center		
Assessments		
	Parameters	Typology
1.1 Data		
Control	Collection- How and what quantity of data is collected	Interview
	Control- Who controls the data, who has the authority over it	Interview
Type		
	Nature of Data collected-qualitative or quantitative	Interview
	Full Public Disclosure -Community Data	Interview
1.2 Framework		
	Administration & Governance model -Hierarchy -Workforce	Observations
Observation	There is a proper hierarchy followed for work division	
	Data Channeling	Interview
	Fallback Procedure (fail -safe)	Interview & Observation
Observation-	Data Centers and Data Redundancy are present, migration to KMS will upload all Data to a Cloud-based system	
	Command & Control Standard operating procedures	Interview
	Technological Assessment	
1.3 Architectural Aspects		
	Space Requirements -Accommodation for a team -Space for equipment & furnishings -Workplace condition(ergonomics and proximity)	Observations

Integrated Command and Control center		
	The Display wall consists of all the packages along with AQI and Environmental Sensor data. The required accommodation is available for a workforce of 20 professionals The server room is equipped with fail-safe measures. A separate power room for supply to the entire workspace is also present The workplace is in good condition with basic facilities like air conditioning, biometric security features, etc	
1.4 Infrastructural aspects		
	Flexibility	Interview
	Maintenance -Regular preventative maintenance -Regular System checks -Update -Repairs	Interview & Observation
Observation	Regular maintenance is done. There are fire safety measures installed	
1.5 Risk Assessment		
1.6 ICCC Maturity Assessment	Functional, Technological & Governance assessment	ICCC maturity and framework assessment toolkit
1.6 SDGs		
	Identified Sustainable Development Goals	Observations & Toolkit
Toolkit results	SDGs Identified are 3,9,11,13,16 (direct positive) Indirect positive-5,6,8 No impact-1,2,4,7,10,12,14,15	

(Source Authors)

Interview with authorities

Meeting between MUDD Team and Mangalore Smart City

Date: 15.03.2022

Location: Mangalore Smart City Office, MCC building, Mangalore

Participants	Designation
Arun Prabha	General Manager, Smart City
Manoranjan Rao	Deputy General Manager
MUDD Team Purushottam Kesar	Faculty
Aishwarya Joshi	Student
Vanlalruatfeli Bawitlung	Student
Raghav Chawla	Student

Interviewer - MUDD Team

Interviewee- Mr. Manoranjan Rao

Deputy General Manager (IT)

Introduction given by Manoranjan Rao about the project- The first phase of the project was completed in 2019, and the second phase is ongoing.

The ICCC has four packages-

- Solid Waste Management
- ITMS-Intelligent Transport Management System
- Surveillance
- Disaster management and emergency response system
- In addition to this- UMS (Unified Management System)

In addition to this- UMS (Unified Management System)

- Solid Waste Management System-Under this system, individual dwelling units, and the garbage collection vans are equipped with QR codes. The collector has to scan the QR code after the garbage has been collected. There are currently 90,000 houses that are already equipped with the codes. The daily report is sent to MCC

Issues-

- The contract between SWM workers and the company is not good. They are hesitant about it, it's additional work for them.
- The workers do not go to every house to collect garbage.

This system aims to monitor the garbage collection and monitoring, and all the vehicles are fitted with GPS, and their location can be traced. Whether they have gone

to their designated wards or not, how many vehicles are in transit is also monitored. The billing or their compensation is based on the kilometers they have traveled and the weight of the garbage collected. The garbage is then dumped into the dump yard.

2nd phase would include ward wise weighing of the garbage (right now, they are all collectively done at the dumping yard)

The users or the residents can scan the QR Code to address their complaints. For example, if the garbage was not collected from their homes, they can file a complaint through an app. (not yet released)

MUDD Team- Is the Corporation coordinating with the Smart city in this?

Manoranjan Rao-Yes the System uses cloud-based data management. The user ids and passwords are shared with Corporation for them to analyze. The supervisor has been given an app to register, monitor & address the grievances.

Mangalore City Corporation owns the vehicles, and these people then go out of the corporation limit and data packages. Whenever the vehicle goes out of the boundary limit, there is an alert on the system. The vehicles are then allotted a supervisor. People can complain about the garbage on the road or of not collected from their homes via calling the 106 number but that data is not shared with ICCC.

MUDD Team- Who maintains the software, does the Corporation has a say in this?

Manoranjan Rao-No, the maintenance is with the vendor under the contract. The contract covers implementation and maintenance for 5 years.

MUDD Team- Is the Smart City ready to give full control to the Municipal Corporation?

Manoranjan Rao-The Smart City is ready to hand over the project to the corporation discussions are also going on, it is their willingness to take.

MUDD Team-How are the funds allotted?

Manoranjan Rao-There is an escrow account to which all the funds can be transferred.

MUDD Team-Why has the Corporation not yet taken over, what are the current issues?

Manoranjan Rao-This would be like additional work, extra cost, checks, and balances.

MUDD Team- What are the impacts of the implementation?

Manoranjan Rao- The SWM started 6 months ago. The feedback has to be given by the citizens but the app has

not yet been released to the public (The development of the app is complete).

The SWM is in place but there is no person from Corporation to monitor it.

ITMS-Intelligent Transport Management System

Manoranjan Rao- The main aim of this is to make people plan their trips better. The system is supposed to provide all the information required to plan their journey by checking the bus route, stops, schedule &, etc all digitally available via the app.

The ITMS is only applicable for buses, the city buses are equipped with GPS (285 but only 150 are connected) installed by Chalo

The Chalo app is free of cost which provides the user interface and a pre-loaded card is also in process. Raw Data has been provided to the Smart City (APIs) only for private buses

NURM buses -40 in number equipped with GPS

Issues- The bus drivers can see other bus drivers' locations through which they try to delay other drivers. The drivers switch off the GPS.

MUDD Team- Are you planning to release the software?

Manoranjan Rao- Yes, but some problems are there like -political pressure during the inauguration. The app can be released to the public only then they will come to know about the problems regardless of how many measures they have already taken to make it robust.

MUDD Team- Has the software been given to a vendor?

Manoranjan Rao- Yes, Madras Security Services Pvt Ltd. They are responsible for the installation and production of software, hardware, smart poles, etc with maintenance.

MUDD Team-What was the budget?

Manoranjan Rao-The budget was 39 cr but they quoted 24 cr only (45% negative)

QCBS-The smart city had proposed the same but the circular from the central government asked not to go with QCBS. Two more bids were considered to make it L1.

For the 2nd phase, Smart City wanted to go for QCBS but again L1 according to the government circular. Now there is a pre-evaluation committee that judges the bids. Due to this process, there is a significant delay, this project was supposed to be completed within 9 months but it took 2.5 years. (2018 finalized)

MUDD Team- Is ITMS Integrated?

Manoranjan Rao- Yes it is integrated, but the app is not yet released.

User Interface & Authority Data

Authority data will have more points - Whether the driver has completed the trip, Timestamps, rash driving, jumping signals, etc. But the user data will have fewer points such as the expected time of arrival of the vehicle, destination & which is the next bus.

MUDD Team- You haven't put up any signboards?

Manoranjan Rao- Yes we have one on the bus stops which shows all the information. It is not the part of the normal bus stand it is a part of the Smart Bus stand only. Smart bus stand has its vendor, the contract is only for one year, so there is a mismatch of contract duration between Smart City and them. There are 20 Smart bus stops in place with PIS (Passenger information system)

MUDD Team- Will the MCC take over all the installed infrastructure?

Manoranjan Rao- Yes immediately. The smart city is an SPV that is supposed to build the infrastructure make it operational, and then hand it over.

Surveillance

Manoranjan Rao- The main objective under Surveillance is crowd management. The surveillance cameras are put up at junctions to monitor traffic violations also.

MUDD Team- What is meant by Crowd management?

Manoranjan Rao- We have mainly put injunctions, where we can monitor traffic violations. But it cannot scan the number plates as of now that system will come in 2nd phase because the vendor did not invest.

For video analytics, we need to buy higher licenses for individual applications. For ANPR and red light violations, there are special cameras required, which are not installed only surveillance cameras are there.

Now there are 15 smart poles in place, each smart pole has 4 fixed lens cameras and one PTZ (pan, tilt and zoom) camera. Entire 360 surveillance- during an event everybody can be monitored for inappropriate actions, theft cases have been solved by using these cameras by tracking every movement of the culprit

MUDD Team- Is the Data then given to the Traffic police?

Manoranjan Rao- Firstly- The traffic police constables come to ICCCC (4 traffic constables) with wireless equipment from morning 9 am to 6 pm every day, they issue challans from here by monitoring through video, around 300 challans were issued daily but now the number has been reduced to 100. The same feed is also shared with the police station.

The data is stored for 20 days on the server then it is put in a drive and is stored permanently.

This is also used in crime detection. Extensively used by police.

The second thing is this data (footage) is not shared with

the public at all, only shared with police and court on order.

MUDD Team- All the Data is not shared with the public or only the footage?

Manoranjan Rao- Only footage is not shared, the rest is available on the web app.

MUDD Team- Have you prepared any protocol for data sharing?

Manoranjan Rao- No, we have not framed anything it is an open data policy provided by the government (mainly APIs)

Disaster management and emergency response system-

Manoranjan Rao- Disaster management and emergency response system. The district has got a disaster management cell which is at present in the DC office. During COVID waves 1&2 they shifted operations here. 1077 hotline number was connected with ICCCC and there were around 40 people here. All emergency response was generated from here including the permits, consultations & etc. All the coordination for food supplies for migrant workers was also done from here.

2nd Wave was not so intense, we were involved in hospital bed management. (allocation of beds according to RTPCR number)

Other mishaps like someone has fallen into an open-pit etc were all monitored and responded to from here. All other disasters like landslides, flooding & etc were also handled from here. But now 1077 has shifted back to the DC office. There is no connection with the DC office and ICCCC for disaster management now.

MUDD Team- What is the future of this cell then?

Manoranjan Rao- It has to be taken over by the DC office. The entire system is developed based on Disaster management SOPs. The application is from bottom to top but the report format to be submitted is given by Center so the correlation is difficult.

MUDD Team- You has so many apps for different uses, how is all this managed?

Manoranjan Rao- We have separate vendors for separate apps. We have got ICOP (Integrated City Operation Platform) which is supposed to be hosted by KMDS, Bangalore. ICOP connects all the seven cities to the government. All the data will be moved to KMDS except Surveillance data. ICOP is a front-end application, all the data as of now is collected in our servers but then it will be available in ICOP through a cloud-based server via KMDS. The advantage is that all the data will be centrally stored and management will be able to look up data for any city. Data Centers & Data redundancy systems are available to make it robust. The existing

servers will be used for the second phase.

MUDD Team- Is the ICOP used for increasing efficiency or safety?

Manoranjan Rao- it is used for providing a common interface on which you can run any application.

It is service-oriented architecture. More like a data extraction tool to run the application. KMDS will only manage the data.

MUDD Team- Can any amendments be then done here, if any new type of data is required?

Manoranjan Rao- Yes amendments can be done here. KMDS is only hosting the data

MUDD Team- Currently there is a close relation between ICCCC and MCC, so what will happen once the data is shifted to KMDS?

Manoranjan Rao- This process is just a soft migration of data. ICCCC comes under DC and is working in synergy.

UMS -Unified messaging System-

MUDD Team- You have to coordinate with various telecom vendors for pushing the message?

Manoranjan Rao- No, the vendor is supposed to do that with 5-year maintenance under contract. The bandwidth is not sufficient.

SMS gateway is available -2 types of providers

Private & Government

Each gateway provider has a tie-up with telecom vendors. There are two selection criteria, the efficiency of transmission and cost. UMS was used extensively during COVID. The efficiency was around 90%. Pop up messages don't cost. DC & MCC are divided on the cost factor because there is no provision for payment.

MUDD Team- How much public participation was there in the ICCCC setup and other pilot projects? What role did they play?

Manoranjan Rao- The people don't understand what it is so very less participation. They are invited but they don't understand so the concentration is very low. We have spent 14 crores but it is not visible to the public unless the app is available.

For phase 2 mainly traffic management is there along with smart parking. We wanted to connect patrol vehicles but there is a loss of coordination as the data from 100, 108, etc hotlines does not come to ICCCC

MUDD Team- What happens if the server fails or some accident has happened the how is the system run?

Manoranjan Rao- That is done by data redundancy, data systems, and KMDS. The data is secured from hacking via firewalls and inspections are done.

MUDD Team- Have there been any data leaks or data loss or theft?

Manoranjan Rao- Regular inspections are done, no pc has enabled USB ports(20) except 5 which are help desk pcs.

MUDD Team- How much staff is there?

Manoranjan Rao- 5 permanent staff

MUDD Team- Are there any special provisions for Women?

Manoranjan Rao- There is a hotline that connects to police patrolling vans for women's safety. But this is not connected to ICCC yet.

Functional Maturity Assessment Criteria

Maturity Rating	Low	Medium	High
Score	<50%	51%-80%	>80%
Simplified Scoring	Yes=1	No=0	N/A information not available)
		Score	Total
Functional Assessment			
Data Acquisition and Visualization Capability Assessment			
Have sensors devices, and activators been deployed as a part of field infrastructure?	Yes	1	
Are the sensors deployed on the field - geo-referenced?	Yes	1	
Do the sensors provide real-time data?	Yes	1	
Is the sensor data available at the command center?	Yes	1	
Is the domain application data available at the command center?	Yes	1	

Maturity Rating	Low	Medium	High
Is the sensor data available in a geo-referenced manner at the command center?	Yes	1	
Is the data from the respective domain application/ smart solution available in a geo-referenced manner at the command center?	Yes	1	
Data Analytics and Co-relation Capability Assessment			
Is the data from sensor/ systems analyzed with data from other sensors/ applications based on the time of the event?	Yes	1	
Is the data from sensor/ systems correlated to data from other sensors based on the location of the event?	Yes	1	
Does the co-relation from multiple sensors/ systems result in the generation of alerts/ exceptions?	Yes	1	
Does the correlation offer prescriptive actions from the event?	Yes	1	
Command & Control Capability Assessment			
Does the system offer standard operating procedures based on alerts?	Yes	1	

Maturity Rating	Low	Medium	High
Does the system provide a real-time view in terms of video, geo-location post generation of alert?	Yes	1	
Are the standard operating procedures (SOP) defined to include the point of contact responsible?	Yes	1	
Are the standard operating procedures defined to include action for Is the person responsible?	N/A		
Are the standard operating procedures defined to include pre-requisites?	Yes	1	
Are the standard operating procedures defined to include procedures?	Yes	1	
Are the standard operating procedures defined to include on-field/premise assets?	N/A		
Communication			
Is the communication protocol (mode, contact details, alternates) included in the SOP?	Yes	1	
Does the system provide for audio communication over multiple channels to the first respondent?	N/A		
Does the system provide for video communication to the first respondent?	No	0	

Maturity Rating	Low	Medium	High
Does the communication channel provide for recording and playback?	Yes	1	
	Total Score	18	22
ICCC Functional Maturity Level		81.82%	
Technology Assessment			
Data Acquisition:			
Integration with Sensors	Yes	1	
ETL Capability	Yes	1	
Integration with Video Feeds	Yes	1	
Integration with Data Feeds and Publishing Data Feeds	Yes	1	
Configuration Layer			
Configuration of SoP Alerts	Yes	1	
Configuration of GIS	Yes	1	
Configuration of SLAs	Yes	1	
Configuration of Data Security Features	Yes	1	
Configuration of Network Control	N/A		
Configuration of User Access Control	Yes	1	
Data Analytics and Co-relation			
Sentiment Analytics	Yes	1	
Predictive Analytics	N/A		
Prescriptive Analytics	Yes	1	
Diagnostics Analytics	Yes	1	
Descriptive Analytics	N/A		
Video Analytics	No	0	
Command and control			
Operations	Yes	1	
SoP Control	N/A		
Access Control	No	0	

Maturity Rating	Low	Medium	High
Device Control	No	0	
Sensors Control	Yes	1	
Field Force Control	Yes	1	
Asset Control	Yes	1	
	Total Score	16	19
ICCC Technological Maturity Level		84.21%	
Governance Assessment			
Governance Framework			
Approved Data Governance policy is in place?	No	0	
Approved Co-Creation and Data Sharing policies are in place?	Yes	1	
Approved CCC Management Structure is in place?	Yes	1	
Approved CCC Resourcing Policy is in place?	N/A		
100% CCC Seat occupancy SLA monitoring is in place?	No	0	
Interim onboarding policy is in place?	Yes	1	
ICCC Training and Capacity annual Budget is in place?	Yes	1	
Support to Field Force (Vendors, Contractors, Officers, Employees etc.)			
Does Field Force use a mobile app connected with CCC?	Yes	1	
Does Field Force use ICCC GIS service for day-to-day operations?	Yes	1	
Field Force can communicate two ways with City CCC?	N/A		

Maturity Rating	Low	Medium	High
Field Force SLA monitoring is in place?	N/A		
Scientific Work/area allocation through ICCC analysis?	N/A		
Decision Making Framework			
City Leadership can decide on a weekly and daily basis using ICCC analytics?	Yes	1	
Area-wise/ Department-wise KPIs are configured in ICCC?	No	0	
City Leadership can assess the performance of its City Leadership can assess the performance of its officers/ employees through KPI compliance using ICCC?	No	0	
Knowledge Management			
Is Knowledge Management application/ services are operational for managing knowledge example critical documents, case studies, local knowledge etc.?	Yes	1	
Stakeholders can update any piece of information or intelligence in Knowledge base using ICCC interface?	No	0	
FAQs for services, processes, and utilities are made available to citizens?	No	0	
	Total Score	8	14
ICCC Governance Maturity Assessment		57.14%	
Maturity Rating	Low	Medium	High
Marks Awarded	1	2	3

Maturity Rating	Low	Medium	High
Score	<50%	51%-80%	>80%
Overall Integrated Command and Control Maturity Assessment:			
ICCC Maturity	Functional	Techno-logical	Governance
Score	81.82%	84.21%	57.14%
Overall Score	74.39%		
	2-Medium Maturity		

(Source (ICCC Maturity Assessment Framework and Toolkit, 2018))

4. Citations

¹CAPEX and OPEX represents capital expenditure amount and operation cost respectively

²The Internet of things (IoT) is the inter-networking of physical devices, "connected devices" and "smart devices", buildings, and other items embedded with electronics, software, sensors, actuators, and network connectivity which enable these objects to collect and exchange data. (Gillis, 2021)

³Security infrastructure includes CCTV surveillance, PASI Public addressal systems) & cyber security

⁴Quality cum Cost-Based Selection (QCBS) - Evaluation based on the cost committed by the bidder and the

technical qualification of the bidder. Quality-Based Selection (QBS) - Evaluation based on the technical qualification of the bidder. (Work through the PPP process, 2011)

⁵Direct positive impacts are related to goals which are directly being addressed by the project

Indirect positive impacts are those goals which are indirectly being addressed via completion of one goal but the project might not have any aims and objectives towards it.

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B9

Revival of a Lost jewel- The case of Gujjarkere: Assessment of the Gujjarkere lake rejuvenation for rainwater harvesting and recreation

Name of the project: Revival of a Lost jewel- The case of Gujjarkere: Assessment of the Gujjarkere lake rejuvenation for rainwater harvesting and recreation

Location: Mysuru, Karnataka

Year of Project Implementation: 2018

Sector: Recreational

SDG: SDG 3, SDG 4, SDG 6, SDG 11, SDG 12, SDG 13, SDG 14, SDG 15

Project Cost: INR 2 Crores

Institute: Anna's University, Chennai

Advisors: Prof. P. Srinivasan

Students: Arjun, Chaitanya, Anshu, Arjun, Anshu, Arjun

Keywords: Smart City, Urban Revitalization, Lake Rejuvenation, Rainwater Harvesting

Abstract:

Abstract: Lakes make an integral part of any ecosystem. They sustain substantial biological diversity, help maintain a region's ecological balance, and support life. A freshwater source is a boon to the people living around it as well as to flora and fauna in an area. The primary functions of lakes are groundwater recharge, flood mitigation, habitat for diverse flora and fauna, recreational activity, and tourism. Mangaluru's Gujjarakere lake, spread over 2.7 acres, is the oldest lake in Mangaluru with great historical significance. Before the rejuvenation, the lake had turned into a dumping yard with residential and medical wastes and a breeding ground for mosquitoes. Neglect over the years also contributed to the lake being converted into a marsh filled with silt. After many failed attempts at rejuvenating, this project was added to 65 projects under the Smart City Mission. In 2019, the process of rejuvenation of the lake began and was completed by 2020.

The redevelopment has improved and upgraded the condition of the lake. The lake has also added value concerning social, economic, and environmental aspects. With the rejuvenation, the lake is also developed as a recreational area. The upgraded lake also aims to contribute to rainwater harvesting, which will help during the summer when there are water shortages.

This report discusses the impacts of the rejuvenated lake on its users and the surrounding environment and the SDGs adhering to this project. The study also intends to understand the project's objectives, significance, and data gaps. The key findings made through observation, semi-structured interviews, and study of various literature have also been discussed in the report.

Case Study: B9

1. Introduction

Mangaluru is a major port city of Karnataka and an industrial, commercial, educational, and healthcare hub. The city spreads over 170 sq km. Mangaluru City was selected under the second round of the Smart City Challenge on September 20, 2016¹. The Mangaluru Smart City Limited (MSCL, the Client), under the Government of Karnataka (GoK), had proposed the improvement of Gujjarakere with the allocation of INR 2 crore from the Smart City Mission Fund with the available areas of improvement as:

- i. Areas falling within the boundary of the lake.
- ii. Immediate areas and access routes around the lake².

1.1 Topic and Context

Lakes and their shoreline give a variety of environmental benefits and influence our quality of life and strengthen our economy. Proper lake operation can reduce the impact of floods and drought by holding large volumes of water and releasing it during shortages. Lakes also recharge groundwater, improve the water quality of downstream watercourses, and protect the area's biodiversity and ecosystem.

Gujjarakere is located towards the southern end of Mangalore city. It is surrounded by residential areas and sparse green, providing a suitable opportunity for rejuvenating and redeveloping by improving the recreation and the water harvesting options for the

residents and beyond³. Rejuvenation of Gujjarakere is a part of the Mangaluru Smart City project. The lake is located towards the southern end of Mangaluru. It is near the Netravati River, which is the main source of water in Mangaluru. The Railway Station, which is the nerve center of the city's transportation, Mangalore Central is within a 3 km radius of the site, while the airport is 17 km.

The extents of ABD and most of the important infrastructure facilities fall within a radius of 1 to 2 km in the southwest direction. Several proposed redevelopments falling within the Smart City Mission are also located within a 5 km radius of the site⁴.

The lake was an organic water body until the year 2011-2012. The construction of the stairs around the lake led to the rectangular form that it has today. The site of the lake showed neglect as it was dry with no prospects of rejuvenation. Presently the lake is recharged by rainwater and a nearby river, while there are two outlets along the south-western and western sides, through which the water flows out. Drains are present towards the western side of the lake to which these outlets are connected. A series of concrete steps in the form of an embankment binds it on all sides. The area around the site has a limited amount of greenery with a few native plant species being scattered around. The Gujjarakere road encompasses the lake on the western and southern

sides and connects to the Bolar road. This major arterial road connects the lake to the rest of the city. Local roads bound the lake towards the north and east side. With the increased area allocated for residential, the socio-cultural activities and interaction spaces and rainwater harvesting would substantially increase.

Location	Ward no- 52
Area of Mangaluru	132.4 sq. km
Population of Mangaluru	499487
Area of the extents of the lake	2.72 acres
The population of the ward	8075

Table 1 Details of the Ward
(Source: DPR)

1.2 Significance of the Project

- i. Gujjarakere is the oldest lake in Mangaluru. Its conservation and rejuvenation have served as a model for the redevelopment of other lakes in the city.
- ii. The project aims to improve and upgrade the lake's overall condition.
- iii. It promotes self-sustainability regarding rainwater harvest development, aiming to store rainwater and groundwater rising through capillary action.



Figure 1 Karnataka
(Source: Map created in GIS Software)

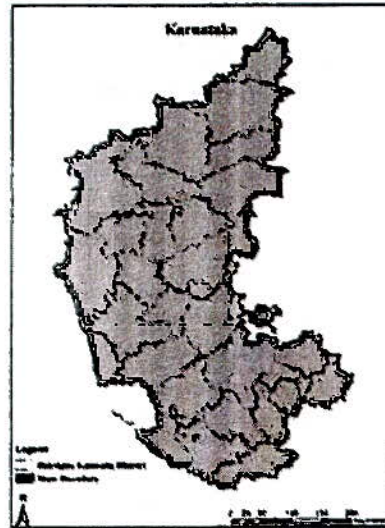


Figure 2 Dakshina Kannada district in Karnataka
(Source: Map created in GIS Software)

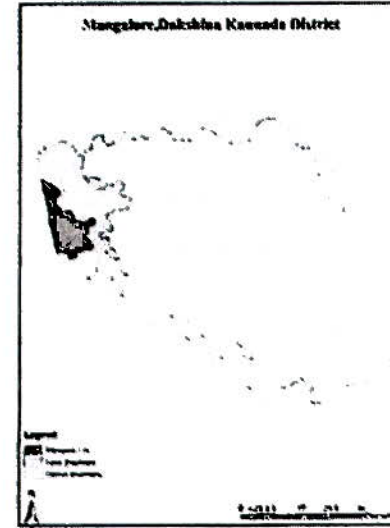


Figure 3 Mangaluru City
(Source: Map created in GIS Software)

- iv. The rejuvenation of the lake is focused on recharging the groundwater and providing a habitat for flora and fauna in the area.
- v. The project has improved the socio-cultural value of the surrounding area and redeveloped it as a recreational space. With the rejuvenation, the issues like mosquito breeding have been addressed by adding a new purpose to the lake and the surroundings with different activities.

1.3 Aim and Objectives

The study aims to understand the social, economic, and environmental impacts of the rejuvenation of the lake and to critically analyze the project in terms of its functionality and its impact on the users.

The objectives of the study are:

- i. To understand the ecological and social impact of the rejuvenation of the lake.
- ii. To study the impact of the project through various stakeholders.
- iii. To analyze sustainable practice through the Sustainable Development Goal assessment toolkit.
- iv. To identify issues and gaps in implementation if any and to provide recommendations for the same.

2. Contextual Background

Spread over 2.7 acres, not only is Gujarakere the oldest lake in Kudala, but also one of the largest with the historical importance of 1800 years attached to it. The lake is linked to two distinguished saines, Macchendraanatha and Gorakshanatha, who lived in the surrounding areas of Mangaluru. Gujarakere was once the only source of drinking water in the past and religious processions from the neighboring temples of Mangaldevi and Marigudi would pass by this lake and the deity was made to have a jhalaka (holy bath) before proceeding further.

Negligence

Over the years, the development of the surrounding area has polluted the lake by draining the sewage into it. But over the century the religious activities stopped completely. And with the industries coming around in

the area, the lake water became polluted. The lake had a lot of drainage seeping into it which became a concern. It became a breeding center for mosquitoes that spread malaria, dengue, and other related diseases.

The Redevelopment processes

Gujarakere rejuvenation process has been developed by Mangaluru Smart City Ltd, as they identified the lake as in despair. Initially desilting operations were conducted and medical waste and other waste were removed. Water plants and weeds which had choked the water surface were removed with great difficulty. This has significantly increased the number of fishes in the lake.

The project took almost a year to be completed, with the inauguration initially proposed for February 2022 being postponed due to the COVID.

Project framework

Future Proposals

To increase the oxygen level in the pond, in course of time, a small boat model aerator will be provided. Leisure activity like boating is under the proposal. A fountain is in the process of being installed at the center of the lake.

2.1 Conceptual Framework/Research Design

The research has been designed within a framework focusing on assessing and understanding the rejuvenation of the lake project through the qualitative analysis of the Detailed Project Report by Mangaluru Smart City limited. Advisory on Conservation and Restoration of Water Bodies in Urban Areas by Ministry of Urban Development Government of India, 2013 has been referred to. This provides a guide to qualitatively analyze the project in terms of the social and environmental impact of the lake and also the impact of urbanization on lakes.

2.1.1 Data Collection methods and analysis

Different types of data collection were carried out, such as observation and understanding of the lake, conducting interviews with the respective stakeholders like the engineers, Smart City officials, and users such as visitors and shop owners, and analyzing different documents and literature.

SDGs and their relevant indicators have been studied and assessed with their role and their impact on the rejuvenation project.

2.2 Key features of the project

Rainwater Harvesting

Regions in and around Mangaluru receive high rainfall in June, July, and August. The peak rainfall intensity is maximum in October. The average yearly rainfall over the last 36 years comes to 3395.2 mm, which is relatively high compared to the neighboring regions. The contributing catchment area of the lake, approximately 24 Ha, has a concave-like shape with the lake centrally located. The land use of the catchment area comprises different types of developments such as residential, roads, and green areas³.

2.2.1 Challenges in the project

- Capillary action is used to fill the Lake with water from a little stream in its northeast corner. The creek was encroached upon and covered by settlements over time. Lake was dry, salt-filled, and transforming into a marsh.
- Even though it is located in a residential area, this lake remained underutilized. Locals and inhabitants were unaware that if properly managed, this lake would increase the social and cultural worth of the area. Mismanagement of the property had resulted in waste dumping along the margins and uncontrolled drain overflow.
- Other lakes in the Mangalore area experience the same problems as the Gujarakere Lake. However, because various lakes have distinct characteristics, problems particular to Gujarakere Lake were recognized first. physical and social surveys were used to accomplish this.
- Due to financial restrictions and a lack of suitable infrastructure, government institutions lack an understanding of the value of the lake in the area and the need for conservation and maintenance. This is a direct result of little or no investigation into the lake's influence on the neighboring areas.



Figure 4 Gujarakere Lake
(Source: Map created in GIS Software)

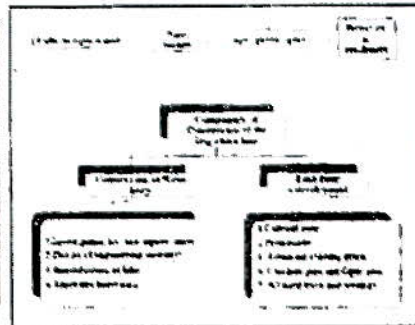


Figure 6 Gujarakere lake with the city context and other smart city projects
(Source: Authors)

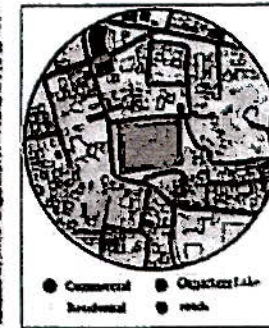
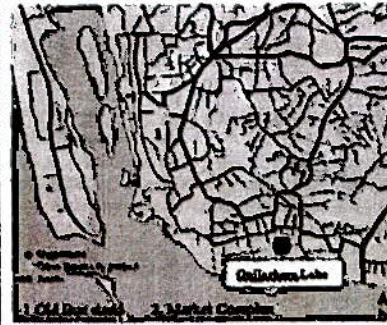


Figure 5 Land use with the lake
(Source: Author)

2.2.2 Risks involved in the project

Dredging and desilting were tedious processes and they involved a lot of variations, time, and manpower.

2.2.3 Features and Benefits

Infrastructure

- i. Design elements such as running and cycling lanes, open gyms, and play areas add value to the space and make it more appealing to locals. The urban design of the lake and its surrounding will enhance the aesthetics and make it more appealing.
- ii. After the steps of the pond were repaired, in the interest of the safety of the children and elderly citizens, stainless steel railings were provided around the pond. By the side of the railing, interlocks are laid on a wide area. This is ideal for walking.
- iii. Streetlights have been provided around the pond. One side of the pond has been spread to create a play area. Gym equipment has been fixed for young people. Anganwadi nearby too has been turned child friendly. Benches, wastebaskets, a concrete connecting road, and green turf for beauty have been provided.
- iv. Some of the trees which stood here previously now exist around the pond. Moreover, 32 new plants have been planted. With the rejuvenation of the lake, the property values of the surrounding residences have doubled, and more properties have come up with this lake.

Social benefits

- i. Rejuvenation of a lake not only caters to the storage of water but also results in the development and aesthetics of the adjacent area to the lake.
- ii. This development creates a socially engaging area for the nearby residential neighborhood, improving its social value.

Economic benefits

- i. When a lake is revitalized, the value of the surrounding properties rises, and a higher property tax may be calculated for these structures. This will strengthen the local tax base.
- ii. The proposed boating activities will help in generating added economy to the lake.

Environmental benefits

- i. A body of water attracts many bird species and

promotes the establishment of various plant species. One of the first noticeable results of lake rejuvenation is the proliferation of plants and animals.

- ii. Proper Lake rejuvenation leads to the formation of a microclimate in the surrounding region. The presence of water in the lake all year leads to a significant fall in the temperature in the surrounding region, as well as the formation of local breezes, which provides a calming ambience.
- iii. All nearby sewage pipes are usually treated as part of reconstruction to restrict sewage flow into the lake. The water that enters the lake is a consequence of runoff, which are then cleansed by the soil on the lakebed, resulting in silt settling and improved quality.

2.3 Key findings from the interviews, surveys, and primary/secondary data collection

The analysis and assessment of the rejuvenation of the lake were based on qualitative methods, which included various documents and literature reading, observations and semi-structured interviews, and empirical understandings. All the methods adopted are characterized by a framework to understand the impact of the lake on the people and the environment.

Case studies

For comparative study, The Kankaria Lake of Ahmedabad and The Jurong Lake of Singapore have been studied. Both these lakes are very context and site-specific with a long history and significance attached to them. Both these lakes have been rejuvenated into popular tourist spots.

i. Kankaria Lake, Ahmedabad

Kankaria is the biggest lake in the city of Ahmedabad, Gujarat. With an approximate circumference of 2.3 km, it represents the regale history of Ahmedabad. Kankaria Lake has an approximate circumference of 2.3 km. It was developed in 2006-07 by the Government of Gujarat at an approximate cost of Rs. 36 Crore.

Rejuvenation process

The lake conservation project was not restricted to only cleaning, de-silting, and other lake-related activities, but also included lakefront development for several activities. Facilities like toy train, indoor stadium, laser show, etc are also developed. The lakefront includes a



Figure 7 Gujarat lake before rejuvenation (Source: Mangaluru Smart City Limited)

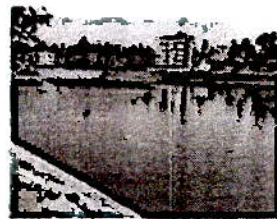


Figure 8 Gujarat lake after rejuvenation (Source: Authors)



Figure 9 The dredging and desilting process (Source: Mangaluru Smart City Limited)

jogging track, aquarium, zoo, park called Naginawadi, and amusement park called Baiwatika. The new stadium is designed to hold two basketball courts, a skating rink, a planetarium, an e-library, a multipurpose hall, a gymnasium, aerobics hall, store-rooms, a stage, and different rooms for table tennis, snooker, and other indoor games⁴.

Past Rejuvenation

The lake was transformed into a Recreational open public space. The response from the citizens was overwhelming. During the last year, more than 1.18 crore visitors have enjoyed the ambience of the transformed Kankaria Lake Front. Festivals, small gatherings, educational tours, jogging, informal meetings, picnics, etc. have become the new face of Kankaria to attract the young generation in a meaningful way. Moreover, because of the environment, the ecology of the place has attracted many new species of birds.

ii. Jurong lake, Singapore

Jurong Lake is a freshwater lake and reservoir located in the western region of Singapore. The lake serves as a reservoir contributing to the water supply of the country. The lake is surrounded by parkland, which serves as a recreational ground for nearby residents in Jurong East and Jurong West New Towns. A landscaped sanctuary called Jurong Lake Park exists around the perimeter of the lake. 2.8 km promenade along Jurong Lake Park allows residents to participate in water sports.

The plan was developed in 2006 by the Urban Redevelopment Authority.

The main features of this plan are as below.

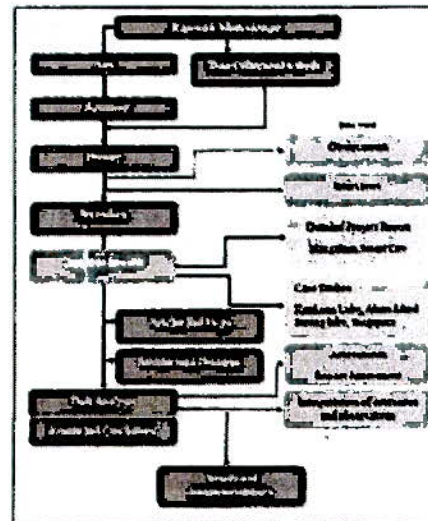


Figure 10 Research Methodology flowchart (Source: Authors)

- i. Some 750,000 square meters of land was planned to be set aside at Jurong Gateway for offices, hotels, food, beverage, and entertainment uses.
- ii. 1,000 new private apartments were planned to be built at Jurong Gateway.
- iii. The new district to be served by three MRT stations and two major expressways.
- iv. The sense of greenery to be heightened with new landscaped open spaces and park connectors at the street level and skyrise greenery in buildings.
- v. New Science Centre to be built next to the Chinese Garden MRT Station.
- vi. A Lakeside village to be developed, and a Chinese and a Japanese Garden were planned to be enhanced.
- vii. An integrated network of pedestrian walkways between buildings and public facilities to be created².

Key understandings:

The redevelopment of the lake done by the Smart Cities Mission has been the only successful redevelopment. Before the planning of the redevelopment, a lot of stakeholders were consulted, like the Lake Development Committee and the Area corporator and there was also public participation. As discussed with Mr. Arun Prabha (General Manager Mangaluru Smart City) who said,

"The people residents and shop owners took active participation and also the pujari of the temple who had an active role in the intervention."

There were no informal settlements around the lake, so there was no conflict relating to ownership. The project cost is 3.7 crores. The lake has a well-defined boundary so there were no encroachments when the Smart Cities Mission took over. There is a nearby river that recharges the lake. This project comes under ABD. The plinth of the lake was built on Vaastu. An aerator has been installed to maintain the quality of the water. The local corporator had problems with the infrastructure because of which a pergola that was initially planned was removed from the plan. People would harm the softscapes, and thus extra care had to be taken to preserve the planted trees. Deeksha Rai (Assistant Engineer Mangaluru Smart City) said,

"When we had initially planted trees, within a day people had destroyed it, and thus maintaining the softscape was a task, and we had to resort to hardscaping more."

Rainwater harvesting is yet to be utilized. Earlier, people would litter near the waterbody and try to jump over,

so railings were put on the topmost stairs for people's safety. The lake has improved the value of the context which has increased the property rates of the land surrounding the lake.

Users

The development of the lake has helped the residents from the surrounding residences and also people who work in the vicinity to visit the lake for leisure or recreation.

Kushal, a frequent visitor of the lake, who works in the vicinity said,

"I like coming here during my work breaks, as it is calm and quiet and gives me a break from my everyday routine."

Earlier, the place was unused, but after the project, people came in great numbers for different purposes. Children come to play, and adults and senior citizens come to walk, gym, sit, and relax mostly during the day and evenings. This has increased activities surrounding the shops. Mukta Nagesh, a shop owner who has been working there for a decade said,



Figure 10 Catchment Area Analysis (Source: Detailed project report)

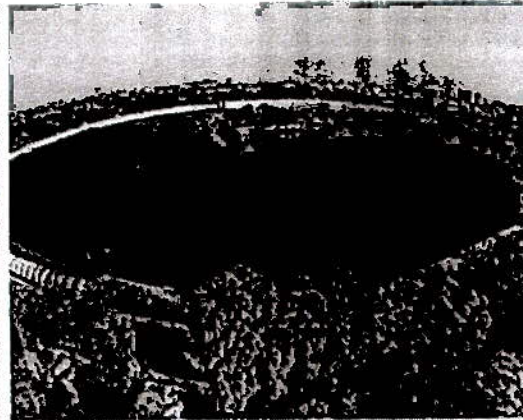


Figure 9 Kankarla Lake (Source: Ahmedabadcourtyard)



Figure 11 Jurong lake (Source: Jurong Lake Gardens)

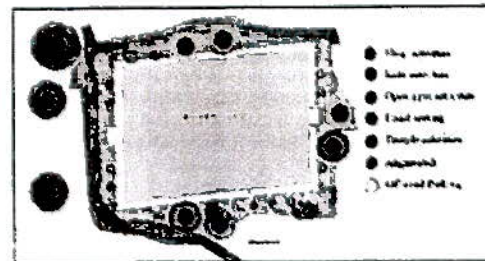


Figure 11 Activity analysis (Source: Detailed project report and Authors)

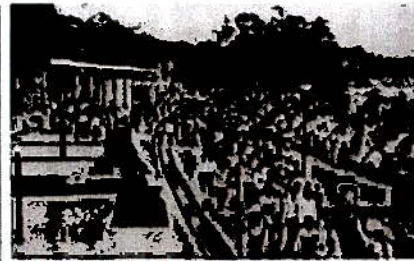


Figure 10 Public Plaza (Source: Development of Lake Conservation Projects, Karnataka)

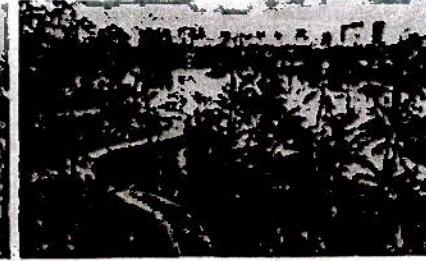


Figure 12 Jurong lake pathway (Source: Jurong Lake Gardens)

"I have seen this lake since I was a kid. Back then, women would even come here to wash clothes. We, as kids, would love sitting here and spending time. But when we grew, this lake started getting neglected, and people stopped coming here. We made many attempts to raise this as a concern to local corporators, but all attempts led to no avail. But after the Smart City Mission took over and the construction began, we were finally happy that this lake would regain its lost glory." The area improved after the rejuvenation of the lake. The area is found to be safer even in the late evenings. The residents wish to have a separate 'kund' of the lake which was initially proposed but not implemented yet for the 'Jhalak' of the idols during Navratri.

3. Discussion and Conclusion

3.1 Implications

The impact assessments of the lake are based on the social, economic, and environmental impacts.

Social Impacts

- i. The lake has increased the social value of the place with people using the space for different leisure and recreational activities.
- ii. The rejuvenation of the lake has increased people's activity and interaction.
- iii. With the development of the pond, children and senior citizens are seen coming here to have a

refreshing walk. In the evening, people can be seen sitting on benches and chitchatting. Small children usually prefer the play area while grownups do exercises in the gym.

iv. Economic Impacts

- i. There is no fare charged for entry or any other purpose. However, a nominal fare in the future will add to the economy of the lake.
- ii. The surrounding property value has increased twice as much as it was before the rejuvenation. More residential buildings came up with the rejuvenation of the lake.
- iii. Future proposals such as boating, student camps or visits, or any public activities can help in generating revenue for the lake.

Environmental Impacts

- Due to the cleaning of the lake and its rejuvenation, mosquito breeding has reduced and thus reduced the chances of diseases.
- There has been a significant increase in the types of flora and fauna in the lake. Different types of birds were observed in the lake.
- The rejuvenation of the lake has added to the microclimate of the lake and its vicinity.
- The lake intends for rainwater harvesting. This will help in overcoming water shortage problems during summers.

Sustainable Development Goals Assessment

The result comprises five types of relations: Direct positive, Indirect positive, and no impact* Indirect negative, and direct negative.

SDGs Identified are

Direct positive: 3,6,11 & 4: Have a direct impact
 Indirect positive: 7,8,13&15: Have an indirect impact
 No impact: 1,2,4,5,9,10,12,16&17

3.2 Limitations

- Due to the short span since the lake was opened to the public, our assessment is limited to a short time-bound study.
- Our research is limited to qualitative analysis, and it does not look into the issues like water quality.
- Due to the short period of the visit, our analysis does not cover activities throughout the day.

3.3 Key lessons learned

- For any project with a strong historical background and location sensitivity, a local architect or a designer aware of the context closely is crucial. Such projects require a great understanding and knowledge of the place and the context.
- The main priority of any project should be to ensure the availability of basic infrastructure and basic needs before any grandiose design intervention.
- People are very religiously or spiritually connected to a certain place, for them, its values remain significant, and so do their religious demands. (as discussed with the users)

DG Goal	Impact
Direct Positives	
Goal 3-Good Health and Wellbeing	Lake's rejuvenation was directly in response to restoring clean water from a mosquito breeding ground, which is now improved with the project for good health and the well-being of the inhabitants.
Goal 6-Clean Water and sanitation	The project aims at sustainable management of water quality in the lake. The lake was restored, and the desilting process and removal of weeds were done to restore the water quality. The inlets from surrounding residential areas were also blocked for sewage—only stormwater is allowed.
Goal 11- Sustainable Cities and Communities	The lake has a long history of 1800 years. The lake is a natural heritage due to its cultural significance. This rejuvenation also achieves the target of - providing access to safe and inclusive green and public spaces
Goal 14-Life Below Water	Due to negligence in past the lake has lost its healthy aquatic life, now the Smart City team is putting efforts to restore the aquatic life back and also prevent loss in the future.
Indirect Positives	
Goal 7-Affordable and Clean energy	Hydropower can be generated at the lake's outlet region in the future.
Goal 8-Decent Work and Economic Growth	The fee collection mechanism will generate revenue for the corporation which can be used for the maintenance of the lake. The maintenance work would require a team-generating employment, due to increased footfall in the area smaller businesses can come up in the future.
Goal 13-Climate Action	The center is focused on reducing the impact of human activities on the environment through the Smart City mission.
Goal 15-Life on Land	The rejuvenation process also impacts the area around the lake, there is an increase in Flora and fauna around the lake. The project has retained original trees which existed before restoration.

Table 2 SDG Assessments

Direct positive	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Indirect positive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
No impact	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Indirect negative	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Direct negative	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Don't know - more knowledge needed																			

SDG Assessments
 (Source: Sustainable, 2022)

- Maintenance and care are not only the responsibility of the officials but also of the people and the municipalities.
- The design of any recreational space should be inclusive to all kinds of users, for instance, Barrier-free architecture should be present for differently-abled people.
- The lake has a huge historical significance to it, a separate tank or a designated area for their idol immersion as demanded by the users would elevate the cultural significance of the lake.
- To generate revenue for the maintenance of the lake, activities such as boating, camps, and outdoor activities should be introduced with fee collection.
- Different types of seasonal plantations can be planted around the lake which will add more to the urban microclimate.

3.4 Recommendations

- A collaborative approach for lake conservation and institutional mechanisms could be provided to facilitate a more straightforward dialogue between various administrative agencies involved in keeping the lake clean and healthy.
- Rainwater harvesting should be given priority to get the maximum benefits from the forthcoming monsoon seasons.
- Instead of giving railings on the topmost stair, the railings could be on the bottom stair, so that the stairs could be utilized by the people for sitting and to have a much closer experience with the water body.
- More softscape should be introduced with more trees, so that during afternoons the trees could provide shade, as not many people were found to be using the space during afternoons. More climate responsive measures are required as the hardscape will cause an urban heat island effect.
- Vendors should be permitted to be working near the lake, as that would increase the people's activities and could generate more economy for the lake. The introduction of social activities leads to greater usage of space and for recreational projects it's a must.
- Public transport should be made accessible to the lake, further increasing footfall.

DG Goal	Impact
Direct Positives	
Goal 3-Good Health and Wellbeing	Lake's rejuvenation was directly in response to restoring clean water from a mosquito breeding ground, which is now improved with the project for good health and the well-being of the inhabitants.
Goal 5-Clean Water and sanitation	The project aims at sustainable management of water quality in the lake. The lake was restored, and the desilting process and removal of weeds were done to restore the water quality. The inlets from surrounding residential areas were also blocked for sewage—only stormwater is allowed.
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Goal 14-Life Below Water	Due to negligence in past the lake has lost its healthy aquatic life, now the Smart City team is putting efforts to restore the aquatic life back and also prevent loss in the future.
Indirect Positives	
Goal 7-Affordable and Clean energy	Hydropower can be generated at the lake's outlet region in the future.
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Goal 13-Climate Action	The center is focused on reducing the impact of human activities on the environment through the Smart City mission.
Goal 15-Life on Land	The rejuvenation process also impacts the area around the lake, there is an increase in Flora and fauna around the lake. The project has retained original trees which existed before restoration.

Table 3: Impact Assessment

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B10

Livability of Urban Lakes- A Case Of Tolankere: Assessment of the impact of Tolankere lake park in shaping community-level open public space

HUBLI-DHARWAD

Name of the project: Assessment of the impact of Tolankere lake park in shaping community-level open public space

Location: Ramlingeshwar Nagar, Hubli-Dharwad

Year of Project Implementation: 2016

Sector: the relationship of public space and infrastructure

SDG: 11, 15, 17

Project Cost: INR 200000000

Institute: School of Planning and Architecture, Bhopal

Advisors: Prof. Gopal K. Mahapatra

Students: Prof. Anandharaman, Prof. Ravi

Keywords: Public development, blue-green infrastructure, urban access, public space, livability

Abstract:

Tolankere Lake, also known as Topalgatti Lake, is an important open space within the ABD area of Hubballi-Dharwad city. It is one of the major water bodies in the ABD area and the second-largest in Hubballi-Dharwad. Under a lake rejuvenation project, Tolankere Lake is proposed for redevelopment to transform and create active community public spaces with recreational facilities. This project is intended to redevelop Tolankere Lake as an active urban space. However, with a dump yard surrounding it, the Lake is filled with sewage & dirt water and due to encroachment by brick kilns, the Lake had become a place for illegal activities. Hence, as a part of the Lake Rejuvenation scheme, the district administration is transforming the Lake into a tourist spot. The fully developed Tolankere lake would be the third Lake in the twin cities transformed to attract recreational facilities.

Case Study: B10

1. Introduction

Lakes are an essential component of ecology. They have traditionally served to supply the population's water needs for drinking, washing, agriculture, fishing, and religious and cultural purposes. Aside from these direct uses of lake water, lakes are also known to replenish groundwater and channel water flow to minimize waterlogging and flooding. They also support a diverse range of vegetation and animals, particularly birds.

However, rapid urbanization has led to the unplanned growth of cities and the deterioration of open spaces and community spaces within urban areas. Urban Indian cities face water crisis due to watershed degradation, increasing pollution levels, deteriorating water balance, encroachment, illegal constructions, and a dire lack of groundwater recharge. To meet the rising water demand, augmenting and improving the health of water bodies is of utmost importance.

Hence, as a part of the lake rejuvenation scheme, the district administration aims to transform the lake into

a tourist spot. The fully developed Tolankere would be the third Lake in the twin cities to attract recreational facilities.

With this background, the government of Karnataka intends to develop and conserve the lakes in Karnataka.

1.1 Topic and Context

Hubballi, located in Dharwad district of Karnataka, forms the second-largest city in north Karnataka with an area of 202.3sqkm holds a population of 943,857 according to the 2011 census. With the connectivity of Indian railway, it is the headquarters for southwestern railway zone.

Under Hubballi Dharwad Smart City (HDMC), there were four open spaces inside ABD (Area Based Development), identified in the SCP to be developed using SCP funds. One of the projects identified was "Redevelopment of the Tolankere lake for recreational facilities" at Hubballi.

Tolankere lake in Ramalingeshwar Nagar, approximately 1.5 Km from Gokul Road, is considered the second biggest Lake in the Hubballi-Dharwad twin cities with a spread of over 23 acres with landuse majorly residential. It is one of the most significant open spaces within the ABD area of Hubballi-Dharwad city.

Past scenario

Tolankere Lake originated from the name Tolan, meaning fox, and kere, meaning Lake. According to the residents of the Hubballi, Tolankere used to be a water reservoir for the foxes and other species of fauna in the past. The primary source of water into the Lake was obtained from the connected nallah from one of the Hubballi's biggest Lake named Unkal Lake. In 2005, Tolankere lake was dilapidated due to the intrusion of untreated sewage water into this lake, making it a breeding ground for an unhealthy ecosystem, leading to the deterioration of the lake's water quality. In addition due to lack of maintenance, the lake was converted into a landfill, and with encroachment from the slum, it became a place for illegal activities at the eastern region of Tolankere

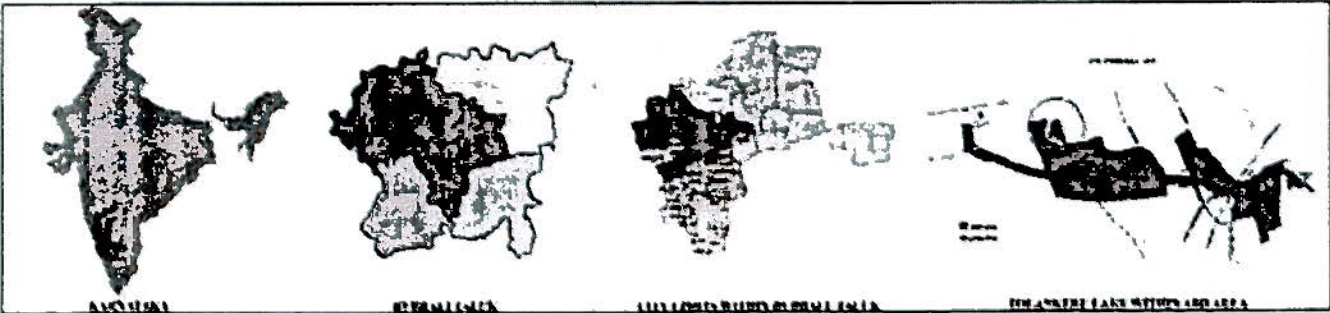


Figure 1.1: Location of the city Hubballi and Tolankere Lake
Source: author

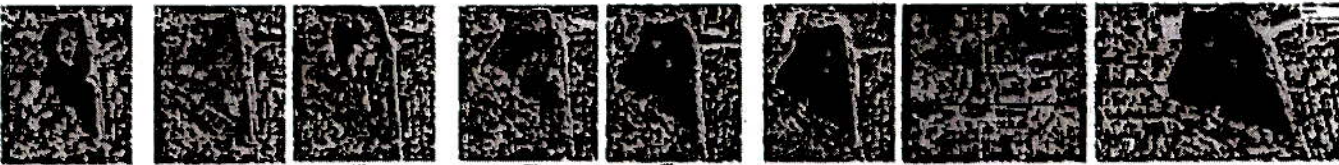


Figure 1.2: Development stages of Tolankere Lake
Image source: Author

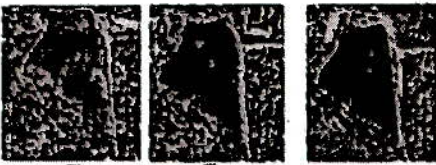


Figure 1.3: Unkal lake and Tolankere lake

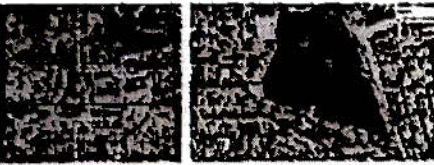


Figure 1.4: Tolankere lake



Figure 1.5: Tolankere Lake before development & after development

lake. Before the redevelopment of the lake, some of the existing facilities were the jogging track, which was of 3 feet and a pavilion for recreational purposes and a watchtower.

Present scenario

As a part of the lake rejuvenation scheme, Tolankere lake is redeveloped and revived in 3 development phases. The first phase worked on cleaning and improving the quality of the Lake by installing aerators and raptors. The second phase is to develop the lake into a biodiversity park for reviving the ecosystem by converting the dilapidated lake into park area with community spaces and some recreational activities for the people so that the whole essence of the lake is revived. After development, the lake park has become the second-largest park in the neighbourhood which has changed the image of the place.

Under the project, attempt has been made to investigate and address issues like the maintenance of the lake park and the sustainability of the Lake concerning future prospects, economic impacts, and environmental impacts.

1.2 Significance of the Project

- i. The said redevelopment of the Tolankere lake would improve the water quality of the Lake
- ii. The health of any urban environment is measured by biodiversity, i.e., the more significant the number of flora and fauna species, the healthier is the environment. Since water as a resource is available in Tolankere Lake, the strategy is to ensure that a large area along the banks is left pervious with soil to support vegetation.
- iii. Proposed activities under the project like yoga, jogging track, open gym etc., have proven to be effective ways to keep citizens active and agile. The children's play area is also a much-needed space to encourage children to spend more time with nature.
- iv. The properly managed Tolankere lake provides recreational opportunities for the users and a



Fig 6 Play area for kids & toddlers

mode of revenue for the Government to maintain the lake, which assists in Rainwater harvesting and protecting the biological resource, enhancing water quality and watershed management.

- v. The creation of vending zones (formal/ informal), Food courts and Parking areas creates employment opportunities and jobs for the informal sector and boosts the local economy.

The research problem is to measure the possible impacts of the usage of the developed lake park area on the people and their surroundings as an ecosystem. The proposed lake park is currently not open for public use, and the assessment is carried out based on the evaluation of the designed spaces and components.

1.3 Aim and Objectives

The study aims to understand the present lake redevelopment project and identify the shortcomings in planning and implementation. Through an assessment of the impact of the developed lake park, it also aims to develop strategies for the longevity of the Lake through a sustainable approach.

The objectives of the study are:

- To evaluate and model the impact of the developed lake park through the sustainability parameters that would make the lake park sustainable and help achieve its longevity.
- To assess the efficacy of the restoration endeavour in Tolankere lakes, Hubballi, India and understand how the revival of the lake park area adds value to the existing conditions and future aspects.
- To analyse the Sustainable Development Goals and their relevance to the project.

2. Contextual Background

The existing Tolankere Lake of 23Acres under HDMC(Hubballi-Dharwad Smart City) was redeveloped in 3 phases. The first phase of development was the existing lake park area which was left unutilized and redeveloped with landscaping & providing utilities and

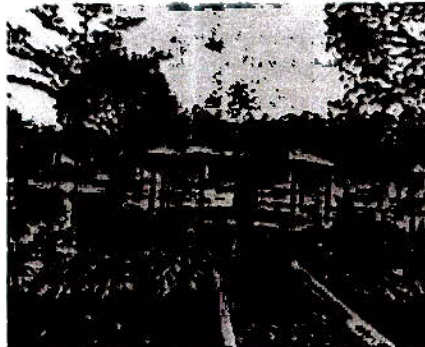


Fig 7 Gazebo for recreational purposes

Source: Retrieved from the website of Hubballi-Dharwad smart city

facilities to make it an active space. The second phase was the undeveloped area which was transformed into an active recreational park with the proposal of a jogging track, gyming, outdoor sports facilities for the community, and the third phase was the water-bound area which was reclaimed by the existing water source from the catchment area and groundwater with an outlet point on the eastern side which further connected the major stream from the Unkal Lake. All the 3phases of development were merged to revive the ecosystem of the Lake.

The Managing Director (MD) - Special Purpose Vehicle was in charge of the project (SPV). The project was managed by the Project Management Consultant (PMC) in collaboration with the SPV and the HubballiDharwad Municipal Corporation (HDMC). The PMC took charge of the project's technical elements. The project's operation and maintenance were carried out by HDMC or a commercial operator who could arrange funds from various sources. The Lake Front Operations were overseen by the Local Development Authority (HDMC), collaborating with the SPV/PMC.

The maintenance of the lake park for its longevity in terms of maintaining the water quality and the proposed facilities of the park was a primary concern that was observed. The project has tried to assess the possible economic, and environmental impacts of the developed lake park area under this project.

The project has also been directly associated with the SDG (SDG11,13,14,15) for lake rejuvenation & development through blue-green integration without harming or destroying local ecology. Assessment of such a project would enable identifying the shortcomings in the planning procedure and implementation. Such evaluation would strengthen the future lake redevelopment projects in understanding the effectiveness of the completed projects, their outcome in conjunction to the sustainable development and its contribution to the holistic approach towards the city in Smart City Mission.

2.1 Conceptual Framework/Research Design

TA qualitative methodological framework has been adapted along with the study of documents (such as DPR) provided by the Hubballi-Dharwad smart city limited to understand and assess the lake redevelopment project. The research aims to assess the impact of the developed lake park area on the end-users by considering the sustainability parameters of urban lakes.

Primary data was obtained through questionnaires to identify and describe the positive and negative outcomes. Documents and drawings provided by the Hubballi-Dharwad Smart City Authority were used as secondary data. This study used a non-experimental, empirical research design. The assessment involved a convenience sample of focus groups, end-users of the Lake, and stakeholders who live in proximity to the Tolankere lake park area.

A literature review of essential publications on "integrated water governance and infrastructure" was done. Similar experiences in the water infrastructure and lake management were investigated, and a research problem was identified with relevant research questions. The field visit was carried out to gather data on urban sub-catchments and lakes and how the project components impact the users and vice-versa. An environmental impact assessment was carried out to understand the parameters about the effect of the environment and its designed features on the users.

2.2 Key features of the project

2.2.1 Challenges in the project

- Maintenance of the water quality of the Lake and the availability of the constant water source so that it could prevent further dilapidation.
- Previously, there was no sewage treatment plant in the Tolankere catchment area & non-availability of the complete UGD system was unavailable in the command area.
- At the eastern end of the lake park area, there was an existing slum that encroached with illegal activities in this lake area, which needed to be addressed.
- Maintenance of The developed 23 acres of lake park area for its longevity was a potential concern.
- Availability of adequate resources such as street lighting, parking facilities, and revenue generation for maintenance of the Lake for economic benefits.
- To be able to cater for every age group of society to promote inclusion.

2.2.2 Risks involved in the project

- The developed lake park with harmful anthropogenic activities by the users could impact the surroundings wrongly.
- Lake contamination

2.2.3 Features and Benefits

• **Infrastructural**
Proposed Activities like Yoga, jogging track, open gym etc., proved to be effective in keeping citizens active and agile. The children's play area was also a much-needed space to encourage children to spend more time with nature.

• **Economical**
The creation of vending zones (formal/ informal), Food courts and Parking areas created employment opportunities and jobs for the informal sector and boosted the local economy. Therefore, an adequately managed lake provides recreational opportunities for the citizens and a mode of revenue for the Government to maintain the Lake.

• **Environmental**
The redevelopment of the lake assisted in Rainwater harvesting and thereby protecting biological resources, water quality enhancement, and watershed management

• **Social**
The social benefits of such a project are not just limited to the people in the surroundings but also to other citizens in the city.

2.3 Key findings from the interviews, surveys, and primary/secondary data collection

The understanding and assessment of the redevelopment project were based on the qualitative techniques of document reading, observation, and semi-structured interviews with various stakeholders (visitors, officials, students) of the project. These techniques were used for understanding the importance of a lake park in a community, the social and economic impact of the project on the end-users, and vice-versa.

• Secondary Data Collection (critical findings from the DPR and other documents regarding the project)

- The existing facilities at the Lake serve as a recreational space (morning walk and laughter club) for nearby localities. Since the lake is still in development, it has been fenced from all sides to prevent encroachments.
- This area is frequently visited by people of various age groups, especially elderly persons for walking and young children for playing, and this facility is expected to rise steeply once this place is fully developed. The activities are planned to meet the recreational and health requirement of the users.
- Proposed activities would promote public health, active communities, and social interaction among the residents/ users.
- The water source to the Lake is from the catchment area and groundwater. The Lake has an outlet point (overflow) on the eastern side which further connects to the major Nala, which originates from the Unkal Lake, the biggest Lake in Hubballi-Dharwad.

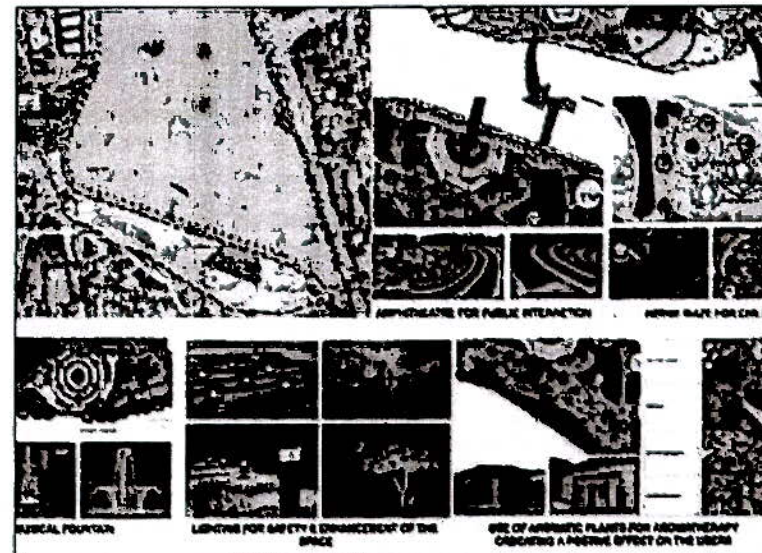


Fig 8 Features of the developed lake park area
Source: author

- e. Currently, the existing sewerage is being discharged into the Lake, which would be arrested by creating a sewerage system and STP. The treated water would be let into the Lake to recharge the Lake. The Lake in itself can act as a rainwater harvest action pit. The lakeshore was developed to protect the edges of the Lake.

• Key findings from semi-structured interviews and observation of various stakeholders

Residents & local people nearby

The questioners for the local people who were frequent users of the lake park area were based on the accessibility, basic infrastructural facilities, and availability of various amenities (drinking water supply, parking, open spaces, etc.)

- a. Most of the lake park visitors were satisfied with the facilities such as a wide jogging path, recreational spaces with a yoga park and outdoor gym facilities. However, there were no signages provided for the easy navigation of the lake park in terms of accessibility and safety of children visiting the park.
- b. There was a provision of smart toilets for persons with disabilities and such amenities were appropriately structured.
- c. **Smart city officials**
- d. The questioners for smart city officials were based on the risks involved in the projects, the aims and difficulties they faced in achieving them. The key findings were:
 - e. Initially, the project faced difficulty in implementing the activities based on the user requirements in different phases.
 - f. Previously, there was a slum encroachment from the Lake's eastern region of the Lake, but there has been no separate entry gate provided for them that could have been inclusive.
 - g. Maintenance of the park was an issue. For this, a five-year maintenance clause has been added to monitor the lake park's cleaning and maintain the Lake's water quality.
 - h. After the redevelopment of the Tolankere lake, it has become a more significant community hub for the Hubballi Dharwad twin city.

3. Discussion and Conclusion

3.1 Implications

To understand the activities and development of the Tolankere lake, an impact assessment report was conducted with the following parameters that were suitable and relevant to the study.

The impact assessment of the redevelopment of the lake park is based on the selected parameters such as use, environmental sustainability, management in terms of safety & security, inclusion in terms of equitable user experience and engagement in terms of community engagement.

Use in terms of accessibility, physical & psychological comfort

Compared to the previous existing scenario of the Lake, the facilities provided needs to be properly maintained Management in terms of safety & security

Previously, this lake park area before development was encroached by the slum dwellers with illegal activities, creating a safety issue for the users of the lake park; thus, after installing the CCTV cameras and adequate physical surveillance, this area has been assured of safety & security for the users. Users seems to be satisfied with the presence of all the basic amenities like drinking water & toilets; however, there is a lack of wayfinding signage.

3.1.1 Inclusion in terms of equitable

user experience Provision of the facilities like Boating Facilities, Yoga/Meditation Area, Children's Play area with equipment, Sand Pit, Designated area for outdoor exercise with Open Gyms, Creation of tree parks and Theme Garden, Aromatic plantations, Walkways/Jogging tracks, Amphitheatre, Food Kiosks, Fountain, Hedge Maze, Water ATM / Dispenser, E-Toilet / Public Toilet was provided considering the equitable user experience.

Community engagement

The primary idea behind the Lake's redevelopment was the community's engagement for a better experience and improving the quality of user experience at the lake park.

3.2 Limitations of the research

- i. Most of the data collected and analyzed in this context has been done on a qualitative basis of data collection.
- ii. The opinion of the people during interviews could have been biased.
- iii. The redeveloped lake project was not open to all the city users; only the local residents could access the lake park for recreational purposes; therefore, the opinion of the other intended users was not recorded
- iv. The quality of proposed elements used in the lake redevelopment has not been considered for the assessment.

3.3 Key lessons learnt

- i. The lake redevelopment has boosted the regional economic development in industry tourism, commercialization and land values.
- ii. The landscaping taken in considerations of green areas has helped enhance the urban climate, mitigate the urban heat island effect, and lessen environmental harm by acting as an ecological balancer.
- iii. The management of natural stormwater systems and other green infrastructures, such as rain gardens and swales with native grasses, help minimize downstream flooding, recharge and filter groundwater and is proved to be more cost-effective and environmentally sound than artificial pipes and storage systems tanks.

3.4 Recommendations

- i. Proper infrastructure such as signages should be provided for the easy navigation and accessibility of the end-users
- ii. There could have been a provision of battery cars for the elderly and cyclable paths for the users.
- iii. Proper infrastructural facilities for users with disabilities, and the elderly like the availability of ramps for the easy access of wheelchairs.
- iv. The natural method of rainwater harvesting should be promoted.

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C22

Conservancy Lanes Quality Evaluation: Prerequisites for space management An Empirical Case of Shivamogga

Location: Shivamogga, Karnataka

Year of Project Implementation: 2017

Sector: Renovation and Redevelopment under ABD

SDG: SDG 11.2

Project Cost: INR 4090.70 BHK

Institute: Department of Architecture and Planning

Advisors: Yagnashree Singh Yadav

Students: Madhusmita MM, Shweta Malavi

Keywords: Urbanization, Conservancy Lanes, Neighborhood, multi-work space Habitat

Abstract:

Urbanization in India is known to be Pseudo Urbanization, meaning imbalanced – most of the focus is on the city centers whereas the veins of the city are not paid attention to, although the city lives in these spaces. Urbanization is a process through which a city grows the population shifts from rural to urban areas, the course in which the society adapts to the change and thus results in physical growth with the need to equip infrastructure to facilitate the growth.

Formerly the conservancy lanes operated as service corridors, with individual homes connected to their respective septic tanks or common septic tanks. "A Conservancy Lane typically refers to a natural passage/service lane reserved customarily in the rear side of properties meant to provide different services to the buildings". As the urbanization rate of Shivamogga city has witnessed growth over the decades, these lanes turned into neglected dumping garbage ground over time.

As per the feasibility report provided by the Shivamogga Smart City Limited, 61 conservancy lanes were surveyed and located in the prime residential and commercial areas with a total length of 7kms. The average length of these lanes is 100 meters and the average width is 3.8 meters. As per the report, only 23 are earmarked for revenue-yielding activities. These lanes were developed into space for car parking, 2-wheeler cum cycle parking, Auto stand, Food Court, Vending Zones, Children's Play Area, and Landscaped areas with an Open gym.

The project has a major positive influence on the livability of the city, improving employment opportunities in the Informal sector of the society, and addition improving the imageability and quality of both the neighborhood and the public space. The objective of this report is to understand the feasibility of these lanes and evaluate the active means of utilization through a framework to facilitate the growth of the city and provide appropriate space management strategies that can be developed for further improvement through a smart approach.

Given the above, all the conservancy lanes were accessed through a framework in conjunction with understanding the neighborhood in which these lanes were located. The method employed was by formulating certain parameters and indicators and identifying the qualities through criteria-based surveys, users' opinions, questionnaires, and observational studies. Using the above methodology, the lanes in the city with varying performance levels and factors responsible for the same can be identified, as a basis for formulating appropriate management strategies to facilitate further improvements and the growth of the city.

1. Introduction

Located in Shivamogga district Shivamogga city is in the central part of Karnataka. It lies on the banks of the Tunga River and is the administrative headquarters of the district. The Government of India intends to transform 100 Indian Cities into Smart cities and Shivamogga was selected under Tier 2 cities. In this context, SPV - Special Purpose Vehicle and SSCL - Shivamogga Smart City Limited to plan, design, implement, coordinate and monitor the smart city projects were incorporated in Shivamogga.

1.1 Topic and Context

The city's vision states, "Transforming Shivamogga, a City of Lakes, Tradition, and Heritage into a leading destination for Smart, Connected and Eco-Friendly communities focused on Education, Research, Entrepreneurship, and Tourism".

Shivamogga's Area Based Development (ABD) proposal included Retrofitting and Redevelopment of 1500 acres of land within the city, impacting about 23% of the city population. The ABD area has 2 distinct divisions concerning its character and land use. CBD Area of 1225 acres and 275 acres of land stretched along either side of River Tunga which is scarcely developed. Under ABD proposals, the Development of Conservancy lanes falls under the sector of Retrofitting and Redevelopment project in Shivamogga city.

As of Annual report 2021, The project of development of conservancy lanes was completed in packages of lanes within a particular neighborhood. Around 176 conservancy lanes are in Shivamogga with a total length of 70 km of varying widths as per the feasibility report. The width of these lanes varies from as low as 2 meters to 5.5 meters. The majority of these lanes are located in the older part of the city. A total of 61 potential conservancy lanes has been developed.

This paper intends to access and evaluate the lanes which are concerning the activities and facilities provided and in turn provide development design options and appropriate space management measures to facilitate the requirement of growth and improvement.

1.2 Significance of the Project

The conservancy lanes which were in a dilapidated condition were hence therefore identified as one of the key projects to be developed under Smart city intervention in Shivamogga. These spaces were utilized as solid waste dumping zones, dump yards for construction debris leading to waterlogging, open defecation, urination, and thus generating abandoned unusable spaces. These lanes needed to be developed

for active means of utilization, to avoid misuse of urban land. The location of the conservancy lanes in the ABD area is shown in Fig 2.4

1.3 Aim and Objectives

The study aims to examine the feasibility of conservancy lanes and develop a framework to evaluate the utilization of these lanes and to further decode appropriate management strategies to facilitate the transforming city of Shivamogga through a smart, connected, and eco-friendly approach.

The objectives of the study are:

- To identify all conservancy lanes and the extent, scale, and dynamics of these lanes.
- To understand the social and urban fabric of the neighborhoods in which these lanes are located.
- To identify the indicators for the feasibility of the conservancy lanes in the neighborhood.
- To provide design solutions and appropriate space management strategies for active utilization of these lanes.

2. Contextual Background

According to the feasibility report, 176 conservancy lanes were located around the city of which 61 of them were



Figure 2.1: Typical Conservancy Lanes In Shivamogga
Source: Feasibility Report on Development of Conservancy Lanes - Shivamogga Smart City Limited

expedient to facilitate the need of the neighbourhood. Of which only 23 were revenue yielding while the rest were urban spaces of gathering and unyielding revenue. The cost of the entire project was estimated at around 4.64CR but cost around a total of 7.9CR.

Past Scenario

Previously most of these conservancy lanes were in dilapidated condition and were underutilized. In most of the lanes, Construction of drains, sewage lines, and Manholes has been completed. The construction debris was left on these sites and the soil after excavation was not leveled. Thus, leading to waterlogging and filthy conditions of mosquito breeding. Open defecation and urination were observed on some of the lanes regardless of the construction of public toilets mostly in the lanes abutting the commercial neighborhoods. Disposal of waste and solid waste dumping zones were also observed in these lanes, leading to the growth of rodents and stray animals, advancing onto wards unfavorable living conditions.

Current Scenario

To avoid misuse, the conservancy lanes were restored into urban public spaces with varying activities. Activities for each of these conservancy lanes were rationalized

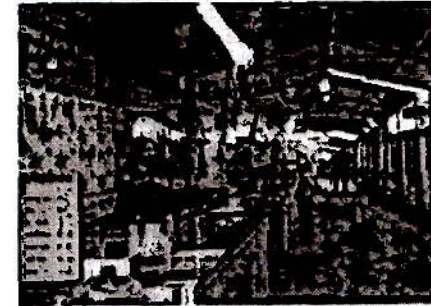
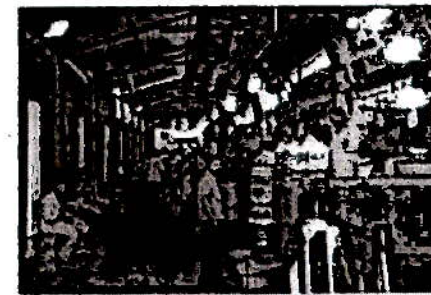


Figure 2.2: Conservancy Lanes developed as Food courts near Tilak Nagar
Source: jñvjo emjn bjorrbjorrb

through a reconnaissance survey, traffic, and land use pattern study according to the existing condition in the area. Resulting in the redevelopment and retrofitting of these lanes to facilitate the need of the surrounding. The description of the lanes and the activities and land use associated has been mentioned in Table 1.

Past strategies for improvement of Conservancies

Past efforts on the development of conservancies. Traffic congestion was excessive due to on-street parking and street vending - food mostly. In around 2011, conservancies were developed into food courts near Tilak Nagar, where food vendors were shifted from the Main Road leading to a reduction in traffic congestion. Similarly, to relieve congestion due to on-street parking on Nehru Road, lanes near Ambedkar Road were developed into covered parking with nominal charges.

2.1 Conceptual Framework/Research Design

The methods employed to further understand and explore feasibility can be broadly divided into four sections:

1. Surveying and locating all the conservancy lanes and segregating based on infrastructure, mode of transport, land use, purpose, quality, and revenue - Data Collection



Figure 2.3: Conservancy Lanes developed for parking
Source: jnyvjv emvjv bjonrbjorb

2. Understanding the neighborhood and the social fabric in which the lanes are located through performance analysis, road inventory, transit line mapping, building use, and activity and movement mapping
3. Address various cases through stakeholder analysis, questionnaires, personal interviews, determining indicators, and defining parameters.
4. Evaluating all the conservancy lanes, characters, and activities under parameters and identifying performance levels, issues, and factors responsible for the same.
5. Developing Design options and appropriate space management measures for further improvement and overall success of the spaces in these lanes.

2.2 Key features of the project

1. Drains, Gates, and Equipment
2. Seating Spaces, Public Toilets, Electrical Poles.
3. Drinking water supply

Activities in the lanes were developed specifically for residential and commercial land use, while some could be developed for both lands uses. Each activity would require a minimum width to function with ease and thus

served as a guiding factor in defining activity for each of these lanes.

2.2.1 Challenges in the project

During the execution of the project, certain drawbacks persisted.

1. **The relocation of electrical and water supply lines:** New pipelines were re-laid under the pavements for the supply of water without disrupting the current course, limiting to a time-bound deadline to ease the tribulation amongst the residents.
2. **Interdepartmental coordination:** Execution of the project was dependent on the coordination between different departments that were in cahoots for the successful implementation of the same. Informing and acquiring permission to ascertain the project stalled the commission further.
3. **Hazardous Working Conditions:** Before the development of these lanes, conservancies were prone to being dump yards. Illegal activities accompanied by foul stench were grounds for an unhealthy environment for the residents and the society. Cleaning of the lanes by the workers is incumbent for the project to get launched successfully.

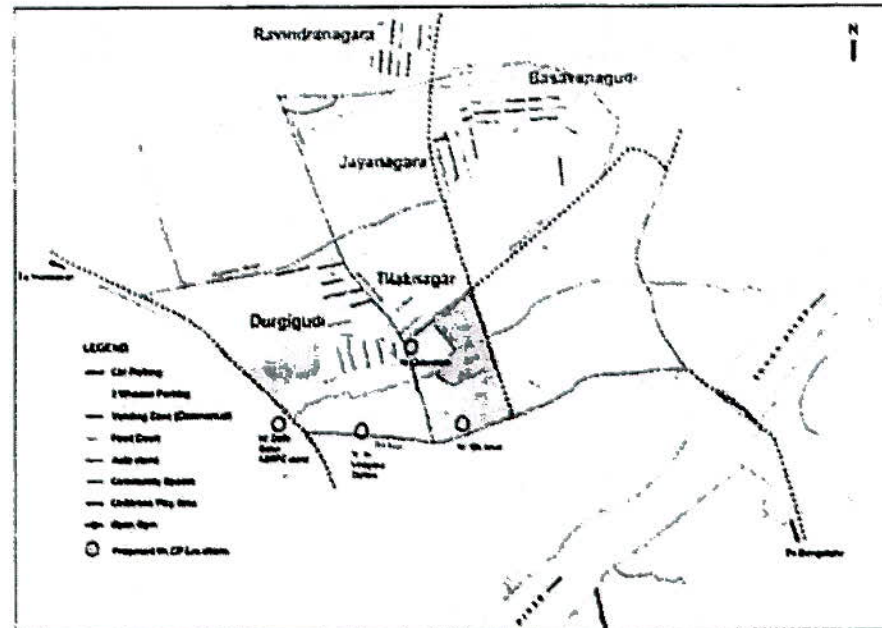


Figure 2.4: Conservancy Lanes in the ABD area of Shivamogga
Source: Feasibility Report on Development of Conservancy Lanes - Shivamogga Smart City Limited

- Relocation of Vendors: Convincing vendors to rent spaces within the lanes to prevent overcrowding in major roadways. Despite intimation of allotment of stalls within the lanes, the sudden upheaval necessitated utmost convincing.

2.2.1 Risks involved in the project

- Maintenance and Management:** With the new lanes developed and restored comes the task of maintaining the lanes. With most lanes being undertaken by the cooperation fewer lanes are being taken care of by the neighborhood welfare association.

- Possibilities of theft and other illegal activities:** With relatively fewer lanes being monitored using cameras, the prospect of the lanes turning over to illicit activities is higher. In the present scenario grills that have been used for rainwater to seep in have been stolen.
- Vandalism of public property:** Regardless of the efforts taken by the municipalities, vandalism is still a subject of the grave issue faced in the development of such lanes.
- The shift in the requirements of the people:** The proposal to design lanes according to the neighborhood and surveys undertaken reflects the requirement akin to a specific location. However, over the years the chance of the neighborhood being modified in terms of its occupiers is salient to keep in mind an open option.

Table 1: Existing condition on all the conservancy lanes

Source: Feasibility Report on Development of Conservancy Lanes - Shivamogga Smart City Limited

Conservancy No	Locality	Lane No	Abutting Main Road	Use (sq. m)	Length (m)	Proposed Activity	Area (sq. m)	Volume (cu. m)	Weight (kg)	Value (Rs.)
1	Mulvan Compound	R + C	Mulvan Road	2.3	62	2 Wheelers Park (Phase)				
2	Mulvan Compound	Commercial	Mulvan Road	4.5	34	Auto Stand				21
3	Mulvan Compound	Commercial	Mulvan Road	4.7	127	Wending Zone (Vegetation & Fruits)				71
4	Mulvan Compound	Commercial	Mulvan Road	4.9	85	Wending Zone (Vegetation & Fruits)				13
5	Mulvan Compound	R + C	Mulvan Road	5.3	121	Car Park (Phase)			22	
6	Mulvan Compound	R + C	Savanga Road	3.4	76	Childrens Play Area				
7	Mulvan Compound	R + C	Savanga Road	3.4	76	2 Wheelers Park (Phase)			33	23
8	Mulvan Compound	R + C	LLR Road	6.2	118	Car Park (Phase)			18	
9	Mulvan Compound	R + C	LLR Road	5.1	113	Car Park (Phase)			18	
10	Mulvan Compound	R + C	LLR Road	4.2	112	2 Wheelers Park (Phase)			24	28
11	Mulvan Compound	R + C	LLR Road	4.3	112	Auto Stand				26
12	Ravathi Nagar	Residential	Savanga Road	3.3	126	Auto Stand				26
13	Ravathi Nagar	Residential	Savanga Road	3.7	127	Wending Zone (Vegetation & Fruits)				41
14	Ravathi Nagar	Residential	Savanga Road	3.3	70	2 Wheelers Park (Phase)			61	43
15	Ravathi Nagar	Residential	Savanga Road	3.6	134	Childrens Play Area				
16	Ravathi Nagar	Residential	Savanga Road	3.3	138	Open Gym				
17	Ravathi Nagar	Residential	Savanga Road	3.3	48	2 Wheelers Park (Phase)			27	
18	Ravathi Nagar	Residential	Savanga Road	2.7	47	Community Space				
19	Ravathi Nagar	Residential	Savanga Road	3.4	77	2 Wheelers Park (Phase)			31	
20	Ravathi Nagar	Residential	Savanga Road	3.2	67	2 Wheelers Park (Phase)			34	
21	Ravathi Nagar	Residential	Savanga Road	3.2	125	Auto Stand				24
22	Ravathi Nagar	Residential	Savanga Road	3.2	41	Community Space				6
23	Ravathi Nagar	Residential	Savanga Road	3.8	126	Childrens Play Area				
24	Ravathi Nagar	Residential	Savanga Road	3.0	41	Auto Stand			6	
25	Ravathi Nagar	Residential	Savanga Road	3.6	113	Wending Zone (Vegetation & Fruits)				29
26	Ravathi Nagar	Residential	Savanga Road	3.3	114	Childrens Play Area				
27	Ravathi Nagar	Residential	Savanga Road	3.2	117	Open Gym				
28	Ravathi Nagar	Residential	Savanga Road	3.8	117	Community Space				
29	Ravathi Nagar	Residential	Savanga Road	2.7	117	2 Wheelers Park (Phase)			78	
30	Ravathi Nagar	Residential	Savanga Road	3.4	114	Childrens Play Area				
31	Balvanthapur	Residential	Savanga Road	3.7	138	Wending Zone (Vegetation & Fruits)				46
32A	Balvanthapur	Residential	Savanga Road	3.4	150	Auto Stand				25
32B	Balvanthapur	Residential	Savanga Road	3.4	118	Open Gym				
33A	Balvanthapur	Residential	Savanga Road	3.8	79	Open Gym				
33B	Balvanthapur	Residential	Savanga Road	3.6	84	Childrens Play Area				
34	Balvanthapur	Residential	Savanga Road	3.8	86	2 Wheelers Park (Phase)			44	
35	Balvanthapur	Residential	Savanga Road	3.8	78	Childrens Play Area				
36	Balvanthapur	Residential	Savanga Road	3.8	80	Childrens Play Area				
37	Balvanthapur	Residential	Savanga Road	3.8	82	2 Wheelers Park (Phase)			42	
38	Balvanthapur	Residential	Savanga Road	3.8	82	2 Wheelers Park (Phase)			55	
39A	Balvanthapur	Residential	Savanga Road	3.8	107	Food Court (Phase)				24
39B	Balvanthapur	Residential	Savanga Road	3.8	113	Community Space				
40	Balvanthapur	Residential	Savanga Road	3.8	88	2 Wheelers Park (Phase)			64	
41	Balvanthapur	Residential	Savanga Road	4.1	98	Childrens Play Area				
42	Balvanthapur	Residential	Savanga Road	2.9	121	Community Space				
43	Balvanthapur	Residential	Savanga Road	3.0	116	Childrens Play Area				
44	Jayamogga	Residential	Savanga Road	4.8	168	Food Court (Phase)			44	6
45	Jayamogga	Residential	Savanga Road	4.5	51	Childrens Play Area				
46	Jayamogga	Residential	Savanga Road	4.5	53	Open Gym				
47	Jayamogga	Residential	Savanga Road	4.5	105	Childrens Play Area				
48A	Jayamogga	Residential	Savanga Road	4.1	125	Community Space				
48B	Jayamogga	Residential	Savanga Road	4.1	88	Auto Stand				19
49	Jayamogga	Residential	Savanga Road	4.7	145	Wending Zone (Vegetation & Fruits)				35
50	Jayamogga	Residential	Savanga Road	3.8	53	Auto Stand				11
51	Balvanthapur	Residential	Savanga Road	3.8	109	Auto Stand				25
52	Jayamogga	Residential	Savanga Road	3.8	51	Childrens Play Area				
53	Jayamogga	Residential	Savanga Road	4.8	51	Childrens Play Area				
54	Durgam	Commercial	Savanga Road	5.3	87	Food Court (Phase)			17	
55	Durgam	Commercial	Savanga Road	3.4	126	Car Park (Phase)			17	6
56	Durgam	Commercial	Savanga Road	5.3	138	Car Park (Phase)			21	6
57	Durgam	Commercial	Savanga Road	4.7	172	Community Space				
58	Durgam	Commercial	Savanga Road	3.3	132	Community Space				

Table 2: Performance Analysis

Parameters	Indicators	Survey
Imageability	Accessibility	Infrastructure assessment and Questionnaires' Infrastructure assessment
	Visibility of the space	
Inclusiveness	Building Edge	Infrastructure assessment and Questionnaires' Rating Scale Questionnaires
	Used by all, irrespective of age, race, class, gender, and physical abilities	
	Control of entrance by fee/usage charges	
	Control of entrance to the space according to specified timings	
Safety and Security	User Perception	Infrastructure assessment Data Collection
	Presence of adequate lighting, Illumination	
	Surveillance Measures	
	Presence of Openings on the building facades Criminal/Accidents Data	
Maintenance	Management of Litter and Filth	Rating Scale Questionnaires and Infrastructure assessment
	Presence and Condition of waste bins	
	Awareness	

Purposefulness	Suitability of layout and design User Perception	Infrastructure assessment: Rating Scale: Questionaries
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Data Collection	Criminal/Accident Data	Revive data from Authorities / Secondary data
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Table 3: How the survey is to be conducted

Kind Of Survey	Indicators	Methodology
Infrastructure assessment	Visibility of the space Building Edge Used by all Presence of adequate lighting, illumination Surveillance Measures Presence of Openings on the building facades Management of Litter and Filth Presence and Condition of waste bins Accessibility Suitability of layout and design	1. Through literature study - Data from the project 2. Through documentation and observation 3. To be done by the assessor/ interviewer 4. A table is created for documentation of the same (Ref. Annexure I)
Rating Scale Questionaries	Visibility of the space Accessibility Used by all Control of Entrance User Perception - Safety Management of Litter and Filth Presence and Condition of waste bins User Perception - Purpose Awareness	1. Personal Interview with the Authorities 2. A series of rating scale questionaries shall be asked to the users of the space. 3. Questionaries format (Ref Annexure II and Annexure III)

2.2.3 Features and Benefits (social, technical, city administration level, impact on environment and economy) to the city

- Reduction in Traffic Congestion and Improvement of Level of Service (LOS)
- Giving thrust to the informal sector of employment
- Improving Sanitation
- Providing community amenities at the neighborhood level
- Economic generators of the city
- Better blocks
- Strives to impart a sense of belonging at the neighborhood level

2.3 Key findings from the interviews, surveys, and primary/secondary data collection

Data collected through interviews and surveys are segregated into three categories for better perception of the zones and the allotted activity.

- Open Gym, play area, and community spaces

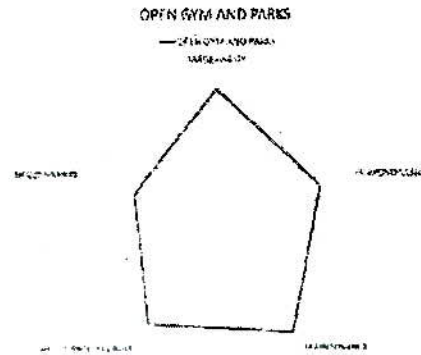


Figure 2.5: Performance Analysis of Open Gym and Parks as per the survey

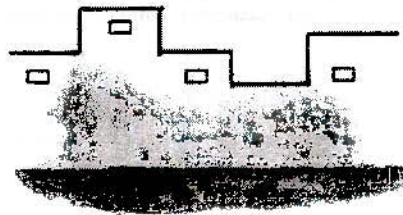


Figure 2.6: Conservancy Lanes along Residential zones

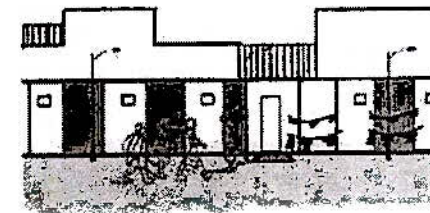
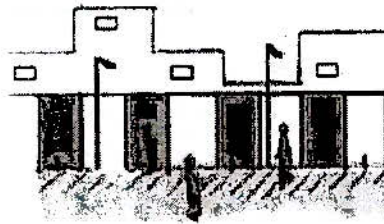


Figure 2.7: Observed: Lanes appropriated for personal use

2.3.1 Data: Concluded through Interview with the Authorities

- Under the ABD Smart City project of Development of Conservancy lanes, the entire project was divided into five packages. Currently, the last package is in progress.
- The majority of the Conservancy Lanes around Residential areas were developed into Open gyms and play areas. Commercial Area Conservancy Lanes were developed to facilitate parking zones
- While Food streets were developed in Conservancies Lanes located near intersections that were dominated by street food vendors. These vendors were relocated in these lanes.
- Resulting in decluttered junctions, subsequently calming the traffic flow. And promoting better blocks and neighborhoods alike.
- As of March 2022, revenue is not being generated against parking. As user-friendly and convenient E-ticketing measures are being developed and trailed.
- Presently Revenue is generated from those Food Street conservancy lanes. This is collected as rentals by the Municipality corporation for maintenance.

2.3.2 Open Gym and Play area: Concluded through Survey and Questionaries

Open gym for adults and play area for kids. As mentioned in 2.3.1, an Open gym and play area are observed in conservancy lanes located alongside residential areas, which thus are maintained and regulated by the respective communities. These spaces are dominantly used by the neighborhood. Consequently, these spaces were designed to cater to the current needs/ ethos of the neighborhood.

2.3.2.1 Observation

- Most of the conservancy lanes which were developed into open gyms and play areas are observed to cater to the needs of all age groups, from kids to senior citizens. Which is subjective in terms of design and facilities provided.
- In terms of safety and security, the feedback of the locals was positive, owing to the fact that the space was enhanced, quoting Local 1 "These lanes initially were very dark, logged with water, smelly, accommodatable spaces, but now it is much better than what it used to be"
- The conservancy lanes are located at the posterior entrances of the residences, inducing the residents to use these spaces for drying clothes.
- The approach was observed to be eminently disoriented as an outcome of poor design and poor implementation of wayfinding principles.
- As Kevin Lynch states, in his book "The Image of the city", "There seems to be a series of public images, each held by a significant number of citizens. Such a group of images is necessary if an individual is to operate successfully within his environment of a given city, neighborhood, or street.
- Imageability is that quality in a physical object which gives it a high probability of evoking a strong image in any given observer. It is that shape, color, or arrangement that facilitates that powerfully structured, highly useful mental images of the environment

2.3.3 Parking and Auto Stand: Concluded through Survey and Questionnaires

2.3.3.1 Observation

- Conservancy Lanes located in the commercial area were developed into Parking Zones for 2- Wheeler, 4- Wheeler, and Auto Stand facilitating the shop owners and customers alike.
- The density of Parking on the Main Road has significantly reduced, these parking spaces are considerably used by shop owners, unlike customers who are inclined to park their vehicles on the main roads.
- At present, no revenue is been generated from

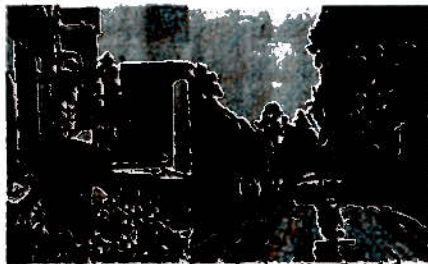


Figure 2.8: Conservancy lanes developed into Park & Gym

these zones, and an E-ticketing system is been considered for the same.

- The space allotted for parking needs better design assessment to avoid the generation of dead spaces, that act as garbage dumping grounds. These zones are maintained by the municipal corporation.
- Lacks security is a major concern at the moment. The provision of signboards, landscapes, and potted plants adds visual character to the space and boosts its usability of the space.

2.3.4 Food Street: Concluded through Survey and Questionnaires

2.3.4.1 Observation

- It was observed that Food vendors had appropriated spaces along the intersection to attract customers, leading to congestion in traffic.
- To overcome this concern, conservancy lanes near these junctions were used to relocate the Food vendors, providing them with permanent space for occupancy. However, the incomes have been averaged out due to the stationary position of the vendors.
- The flow of population is at its peak during lunch hours between 1:00 PM – 03:30 PM and the space observes a second peak between 7:00 PM – 08:00 PM. Food is mostly prepared on site.
- The Vendors have adapted to the street and altered the space based on their requirements, with tiles, lights, and CCTV Cameras.
- The space was provided with a water supply and Handwash at every interval of 10M, along with seating spaces, and a ventilator aiding both vendors and customers.
- Approach to these streets is cramped with vehicles of the vendors, the space is not barrier-free, as barricades have been placed to avoid vehicles barging in.

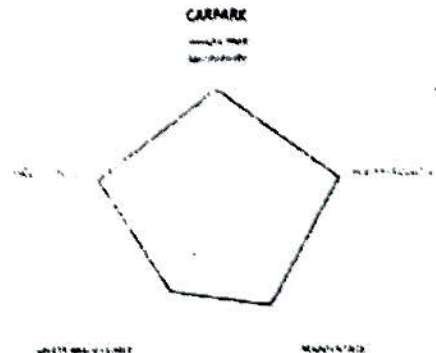


Figure 2.9: Performance Analysis of Car Parking Zone as per a survey

3. Discussion and conclusion:

Through survey conducted and on-site data collection, the following observations were made.

- It is evident that to facilitate a healthy and clean environment for the people, the government initiative to work on the conservancy lanes has an impact on the society and as a result has a profound influence on the urban fabric of the neighborhood and the city.
- The scale of the conservancy lanes defined the purpose it was meant to cater to. As stated earlier the lanes along residential locality were adapted to suit the needs of the residents, while, the lanes along the commercial sectors were focused to take the edge on bottlenecks, created by the local food vendors and the common public who were interdependent.

Most of the conservancy lanes are located in the older part of the city. With frequent usage, these lanes could adhere and become distinctive districts of the city. Talking to a resident, she specifies that "Ever since the conservancy lanes have been worked on, they've felt very safe on the lanes and find the lanes to be social spaces for the residents to meet up occasionally".

- In the Commercial sector of the conservancy lanes, the personalization of these stalls has made the

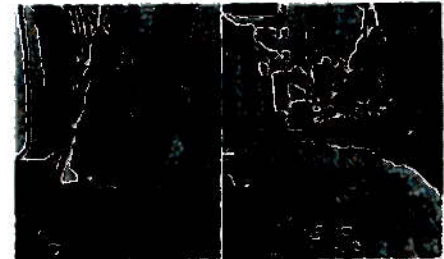


Figure 2.10: Conservancy lanes developed into Parking Zones



Figure 2.11: entrance to the food street modified by the vendors

lane more approachable. Despite the movement of people through the lane, the demarcination of the lane from the rest of the neighborhood is a grind to follow through.

- In the conservancy lanes located along the commercial lanes, car parks have also been provided. The Boom barriers that are yet to function have been installed on-site to monetize from the car park.
- Regardless of the attempt taken forward by the mission, safety and maintenance are two main factors to look into in the preservation of these lanes. Constant monitoring is required for the usage of these lanes.

3.1. Implications

3.1.1 sustainable development goals assessment

The sustainable development assessment goal is a toolkit that was followed to observe the sustainable development goals adopted by the conservancy lanes. Of the 17 goals that exist in totality, it was observed that four of the goals have no impact on the development of conservancy lanes. The rest 13 goals had either a direct impact or an indirect impact on the development of these conservancy lanes.

The revamp of conservancy lanes has helped in the achievement of the following goals:

Goal 3

good health and wellbeing:

The conservancy lanes have been transformed immensely from their earlier state. Lanes that were



Figure 3.1: Conservancy lanes developed into car parking zones in requirement of constant supervision



Figure 2.12: Performance Analysis of Vending Zone - Food Street as per the survey

no longer used and considered major flaws of the city have been redeemed for use now and has been cultivated with good intentions to inculcate the sense of neighborhood within. In doing so, the once ungodly lanes have been put into good usage and are now spaces that propagate good health and well-being.

Goal 6

Clean water and sanitation:

Clean water and sanitation a goal has played a significant role in improving these lanes. The pen drains have been closed and proper rainwater can penetrate within without harboring insects to breed. The lanes that are closer to commercial shops have been provided with water for their usage. Washbasins are also installed every few meters within the food stalls for the consumers to wash their hands. Sanitation issues have been well addressed in these lanes by providing washrooms for the vendors.

Goal 8

Decent Work and economic growth:

The vendors from the food lanes have a decent economic

wage from the shift that has been brought by developing these conservancy lanes. By installing Boom barriers in parking lanes, a source of income is generated for the city.

Goal 11

Sustainable cities and communities:

Making cities sustainable means creating career and business opportunities, safe and affordable housing, and building resilient societies and economies. It involves investment in public transport, creating green public spaces, and improving urban planning and management in participatory and inclusive ways.

3.2. Limitations of research:

- Some official statistics such as crime data could not be considered valid as most cases go unreported.
- Hesitancy in answering certain questions of the survey to avoid any implication.
- Limited availability of time to venture into all conservancy lanes as a few were under construction and a few were closed.



Figure 2.13: Conservancy lanes developed into Vending Zones - Food Street

- Certain survey answers could have been biased and could change depending on the age group and gender.

3.3. Key lessons learned:

The key lessons learnt during the survey and the observation are as follows:

- Conservancy lanes have made distinctive boundaries within the city at the neighborhood level. These lanes have increased the social interactions within the neighborhood and are seen as safe places to hang around.
- Safety and well-being are key aspects that have had an impact on the neighborhood. Although the lanes have been seen through a specific lens for the city the people within have adapted the lanes to their personal use. Accessibility and linear line of sight are two important factors that contribute to the success of these lanes to date.
- The conservancy lanes along the commercial sectors have another storyline to them. The shift

in the placement of the stalls to a conservancy lane was not welcomed initially with warmth. Much to the surprise of the public after the development of these lanes, the vendors have been finding it easier to sell their goods. The vendors further went into the role of placemaking by demarcating their spaces in the form of tiles and countertop slabs. This initiative of the shopkeepers has helped the public in also differentiating between spaces.

- The car parking spaces along the conservancy lanes near the commercial lanes have been initiated with a proper understanding of the site based on the land usage and the occupiers. Though this can be seen through its implementation, the main problem that is faced currently by the users of the lane is the lack of safety. Though boom barriers have been installed on either side of the lanes, it hasn't been facilitated still. The maintenance of these lanes is still in an awry state. Theft of common property is still ongoing and hence security needs to be heightened in such places. The rainwater pipes are directly let

onto these lanes and are not covered. This causes discoloration on the walls of the lanes and would have an impact on the imageability of the lane.

3.4. Recommendations:

- In the residential sector, the lanes are linear and are lacking in softscape elements. These elements would

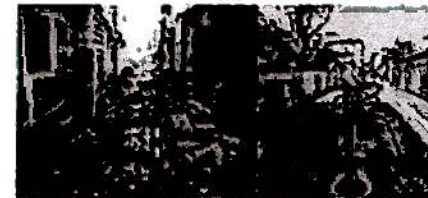


Figure 3.4: Conservancy lanes before and after



Figure 3.5: Transition Observed in Conservancy Lanes in the Residential Areas

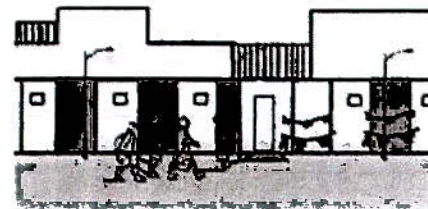


Figure 3.5: Observed Building Adaptation subsequently to the up-gradation of the lanes: Balconies, Larger fenestrations towards the lanes



Figure 3.6: Observed Placemaking, the process through which we work together to shape our public spaces.

sdg impact assessment conservancy lanes

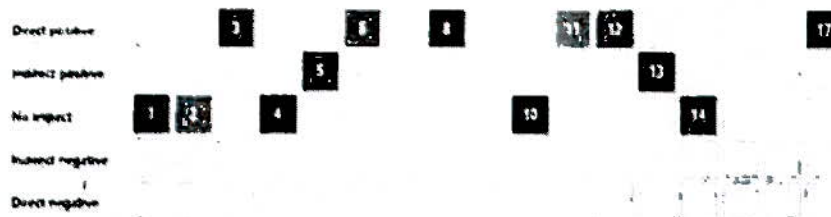


Figure 3.2: SDG Impact assessment of conservancy lanes



Figure 3.3: sustainable development goals

help in improving the vitality of the space. The blue and white stripes on the walls of the lanes break the monotony of the stretch of the conservancy lanes. Seating spaces could be provided along the lanes for the members of the locality to sit, as the lanes run up to 100m or more at times. Though they form districts and act as landmarks for the locality the imageability of the space could be worked on more by creating wall art and instilling the culture of the space through art forms.

- Certain conservancy lanes started on one end and took another direction towards the end. Anyone visiting the lanes for the first time could have difficulty knowing where one lane begins and ends. For such blind spots in conservancy lanes, markers could be provided to not be blindsided.
- The conservancy lanes that have been turned into food courts require proper demarcation from other public spaces. The entrance to the food court is congested and could be maintained well.
- Maintenance is the main issue faced in conservancy lanes operated in commercial sectors. Security has to be improved through the allocation of CCTV cameras as these areas are also prone to burglary and the rainwater pipes coming from the building could be connected well-using pipes so that the flowing water doesn't discolor the painted walls.

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Annexure I – Road Inventory to be conducted

ASPECTS / CASES	Parking and auto stand	Open gym, park, and community garden	Vending zone – food street
Visual Obstacles between the vantage points			
Visibility from the immediate surroundings			
Building Edge			
Control of entrance			
Barrier-Free			
Presence of adequate lighting			
Are there any dark spots in the space			
Presence of Security/ CCTV			
Presence of Openings on the building facade			
Storm Water Drain			
Smell			
Presence of Dust Bin			
Pavement Material			
Traffic Volume			
Presence of Urban Elements			

Annexure-II – Questionaries to be asked to the Authorities

Open-ended questions addressed directly to the Authorities involved in the project
 Understanding of the urban space, Range of issue, Environmental Factors, Understanding the community, Barriers, Resources, Assets: Urban and Social Fabric of the Neighborhood

Name:

Occupation:

Telephone Number:

Name of Organisation:

1. What were the risks involved in this project?
2. What kind of connections does your organisation have with local businesses, banks, and local government authorities?
3. What are the issues that you have faced till date? Explain briefly with reason for the issue
4. How often do the issues arise in the neighborhood?
5. Major issues in the last years.
6. What are the current initiatives? How are you going about them?
7. Major objections/hindrances faced while problem-solving, anyone specific
8. Any criminal/ accident data of the areas around these lanes.
9. Any controlled timings for spaces, if yes, why?
10. If yes, what kind of spaces are provided with controlled timings for entrance?

Annexure III – Questionaries to be asked to the Users/Locals

Name:

Personal Address (Specify Street):

From how long have you been living in this locality?

- 0 - 2 yrs.
- 2 - 5 yrs.
- 5 - 10 yrs.
- More than 10 years

Why did you choose to live in this neighborhood?

How often do you visit the space?

Questions	Strongly agree	Agree	Disagree	Strongly disagree	Don't know	Refuse
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VISIBILITY OF THE SPACE

There are a lot of visual hindrances in this space
 I cannot see the immediate surrounding from this space
 The space is in a good condition

ACCESSIBILITY

I cannot navigate this urban space
 I have to use a public private transport system to reach this space
 I can easily walk to this space

USE BY ALL

The space is accessible by all irrespective of age, race, class, gender, and physical abilities

PERCEPTION – IN TERMS OF SAFETY

There are too many people hanging around on the streets
 Violence is not a problem in my neighborhood

The area has an adequate presence of lights and illumination

The space lacks security arrangements

PERCEPTION - IN TERMS OF PURPOSE

I find this urban space well organized and benefits my activity

I don't like how the space is designed

WASTE MANAGEMENT

I am against the waste segregation initiative

There is a lack of dust bins and waste management facilities in the lane

AWARENESS

These facilities don't have information/ complaint centers that I am aware

Questions	Regular	Occasionally	Never
Do you travel by public transport to reach the place?			
Do you find it hard to move around the place?			
DO you find the place easily accessible to you?			

Questions	Yes	No	Sometimes
Do you feel safe in this lane			
Is there sufficient lighting in this lane?			
Are you satisfied with the changes implemented to the lanes?			
DO these changes satisfy your need? Is there any drawback if so?			
How efficient is the waste managed in the lane?			
Are you aware of the complaint centres for the lanes?			

C23

Slum To Home: Assessment of housing and basic services for urban poor at Mariyamma Nagar, Tumakuru

Name of the project: Housing and basic services for urban poor at Mariyamma nagar, Tumakuru

Location: Tumakuru, Karnataka

Year of project implementation: 2019

Sector: Housing

Project Cost (Rs. Crore): 13.53 Cr

SDGs: SDG 1 No poverty, SDG 3 Good health and well being, SDG 5 Gender equality, SDG 6 Clean water and sanitation, SDG 7 Affordable and clean energy SDG 10 Reduced inequalities SDG 11 Sustainable cities and communities

Institute: School of Architecture and Planning

Advisors: Praveen Kumar Kesari

Students: Sachin T

Keywords: Smart Cities, Low Cost Housing, Smart development of Housing, Tumakuru

Abstract:

The Smart City Mission was launched by the Government of India to provide core infrastructure, and clean and sustainable environment in Indian cities through smart solutions. As part of the mission, to address the growth of informal settlements in the city caused by rapid urbanisation and industrialisation of the city, Tumakuru Smart City Limited had proposed the "Housing and basic services for urban poor at Mariamma Nagar". The project aimed to provide slum dwellers with better housing conditions, access to physical infrastructure and improve the social conditions of the community. In this report, we have tried to understand the aim, objective, and significance of the project and its impact on the community. We also present the key findings of the project through observation, semi-structured interviews, and study of various reports and existing data. The relevance of SDGs to the project have also been discussed.

1. Introduction

1.1 Topic and Context

Tumakuru city, the district headquarters of the Tumakuru district located in the southeast of Karnataka is an industrial city that is spread over about 48 square kilometres and is near the Karnataka state capital Bengaluru which is located 70 kilometres southwest of Tumakuru. Tumakuru has been selected as one of the 100 Smart Cities to be developed in India under the Smart City Mission of the Government of India.¹

Tumakuru's Area-Based development (ABD) proposal revolves around retro-fitting of about 1400 Acres in the Central Business District (CBD) area along with several other interventions such as decongesting the city centre and upgrading the available infrastructure & services. One of the projects identified under the Smart City mission is the "Housing and basic services for urban poor at Mariyamma Nagar" in an Engineering, Procurement and Construction (EPC) mode. This the slum

rehabilitation project tries to investigate and address various issues like lack of basic services, land tenure and ownership, substandard housing conditions, unhealthy living conditions, poverty, and social exclusions

Mariyamma Nagar slum, situated in the centre of the city (13°22'39" N 77°08'03" E) belongs to ward number 14 and survey number 120 with an approach road of 9 meters. The location of the slum and its context can be referred from image 1.

The inhabitants of the slum, originally from the State of Tamil Nadu, are migrants that have been residing in the slum since the past 80 years for three generations. With an average household size of 4/5, 87 families consisting a total of 368 people inhabit the slum. Most of the houses are semi-pucca, followed by kutcha houses. Kutcha and semi-pucca houses together constitute more than 75%, which as per guidelines and norms are considered as bad housing conditions. These houses are mostly self-built by the residents of the slum. Many of them are engaged in daily wages job where a significant number

of women are engaged as domestic workers. Almost all the families lived in their self-built houses. Most of the families practices hinduism and fall under the scheduled caste category.²

Table 1 Mariyammannagar slum details

Location	Ward no. 14
Total Population	368
Total no. of families	87
Total no. of households	81
Average household size	4.5
Total no. of Aadhar cardholders	353
Total no. of BPL cardholders	87
Total no. of voter ID holders	188

Source: Detailed Project Report on Housing and basic services for urban poor at Mariyamma Nagar, Tumakuru

1.2 Significance of the project

- a. The redevelopment of the informal settlement of Tumakuru i.e Mariyammannagar slum can improve

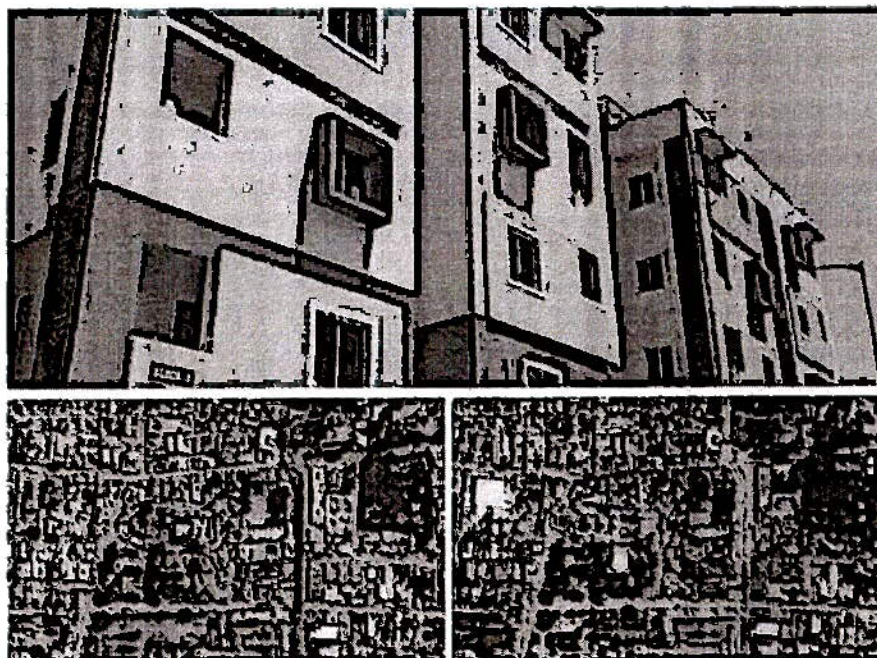
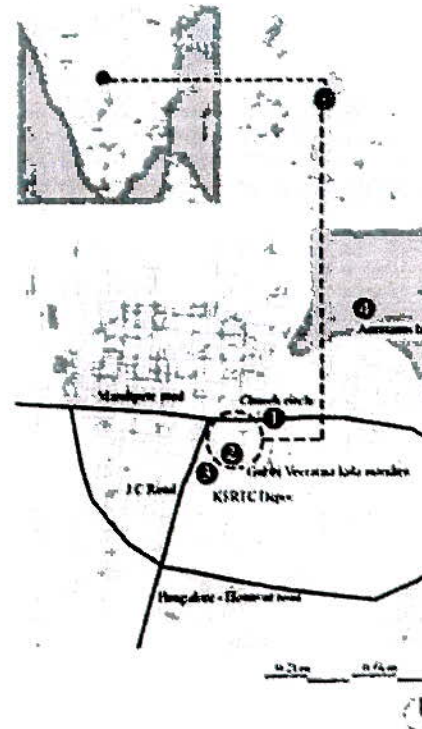


Image 2 Slum dwellers of Mariyammannagar in 2018 (left) newly built residential complex (2020)
Source: Detailed Project Report on Housing and basic services for urban poor at Mariyamma Nagar, Tumakuru



¹ Detailed Project Report on Housing and basic services for urban poor at Mariyamma Nagar, Tumakuru

the social and living conditions of the slum dwellers.

- b. With permanent land ownership/tenure and added social security, the economic condition of the dwellers can progressively improve with time
- c. Better and improved living condition of the settlement can also improve the health conditions of the dwellers who otherwise are vulnerable to many diseases related to unhealthy living conditions.
- d. The lack of basic infrastructural facilities such as water supply, sanitation, and electricity in the slum areas can also be addressed
- e. The slum rehabilitation project can help to formalise the people living in the informal settlements (i.e. Mariyammanagar slum).

1.3 Aim and Objectives

The study aims to understand the slum rehabilitation project and identify the shortcomings in its planning and implementation.

The objectives of the study are :

- a. To understand the impact of the newly developed housing complex on the social and economic conditions of the slum dwellers.
- b. To understand the risks and challenges faced by the ULBs, and various authorities in the implementation of the slum rehabilitation project.
- c. To evaluate the relevance of the slum rehabilitation project to the Sustainable Development Goals and its indicators

2. Contextual Background

Since the past 80 years the slum dwellers have been living in the land that belongs to the government . But recently, with a private party claiming ownership of the land, the land has been under litigation leaving the slum dwellers insecure with a possibility of being evicted. The settlement also lack access to basic services like water supply, sanitation, and electricity. Waterlogging issues are commonly reported because of no proper stormwater drains in the area.

Absence of physical and social infrastructure

The status of physical infrastructure and environment is very poor in the Mariyammanagar slum of Tumakuru. The housing community lacks most of the basic essential services. The houses do not have water supply connection instead, a common water tank is the only source of water for the entire slum. Few houses have underground sewage connections which are also poorly maintained and most of the houses had a soak pit. The closed stormwater drains are also used as sewers in a few cases causing a threat to public health, especially during monsoons and floods. Within the vicinity of the slum is a temple with a small foreground that is used as a gathering space for religious activities and an Anganwadi. (Image 3)

Slum rehabilitation project

After the Mariyammanagar slum was proposed to

be redeveloped under the smart city mission, A G+4 structure with 3 such blocks has been built on the site which is 150 meters away from the existing slum with all the necessary basic infrastructure. The project, commencing in the year 2019, has been handed over to the beneficiaries on 6th January 2022. (Image 4)

2.1 Conceptual framework / Research design

To understand and assess the slum redevelopment project, a qualitative design strategy has been adopted along with the review of documents (such as DPR) provided by the Tumakuru Smart City Limited. To draw the framework in a structured, objective and systematic way the 'Slum Upgrading Legal Assessment Tool by UN-Habitat, 2019' has been referred. The tool provides a perspective on indicators such as land, planning, basic services, housing, and financing that would help in qualitatively analyzing the slum redevelopment.

Data collection and analysis

Data collection has been done by conducting semi-structured interviews with the beneficiaries, engineers, and smart city officials of the housing project at Tumakuru and observation of the redeveloped housing site. To understand and analyse the outcomes of the slum redevelopment project, the 'Evaluation of Slum Upgrading Programs by Laura Jaitman and José Brakarz, 2013' has been referred to.

The SDGs and their indicators are studied with their relevance and impact on the slum redevelopment project.



Image SEQ Image 1 ARABIC 3 Condition of the Mariyammanagar slum before rehabilitation
Source: DPR on Housing and basic services for urban poor at Mariyammanagar, Tumakuru

2.2 Key features of the project

2.2.3 Challenges in the project

- a. Since the land required for the slum rehabilitation was occupied by other squatter settlements, relocating the squatters and acquiring the necessary land for the development has been one of the challenges for the implementation of the project.

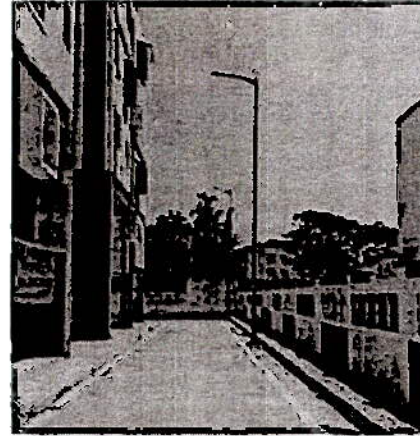
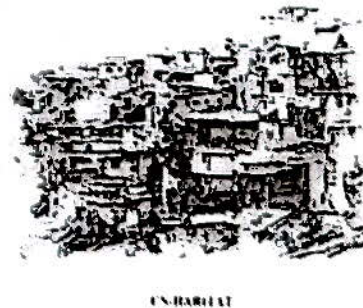


Image SEQ Image 1 ARABIC 5 The Slum Upgrading Legal Assessment Tool by UN-Habitat, 2019
Source: The Slum Upgrading Legal Assessment Tool by UN-Habitat, 2019

Slum Upgrading Legal Assessment Tool

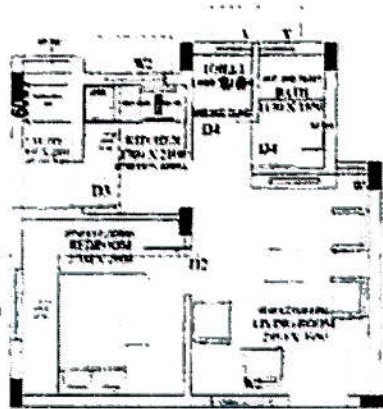


UN-HABITAT

- b. Gaining the trust of the community to support the ULBs and authorities in the implementation of the project.
- c. Identification of the original inhabitants of the Mariyammangar slum i.e. identification of the beneficiaries.
- d. The project had to be completed within a stipulated timeline.

2.2.4 Risks involved in the project

- a. Failure in acquisition of the proposed land for redevelopment would have resulted in



- the relocation of project site. This would have affected the timeline of the project.
- b. Opposition from the dwellers or any organisation/political group/institution against the redevelopment of the slum.
- c. Identification of the wrong beneficiary would result in the wrong usage of public funds.
- d. Since the project had to be completed within the said time frame to gain the trust of people, any delay would reflect bad review on other future slum redevelopment project in the city.

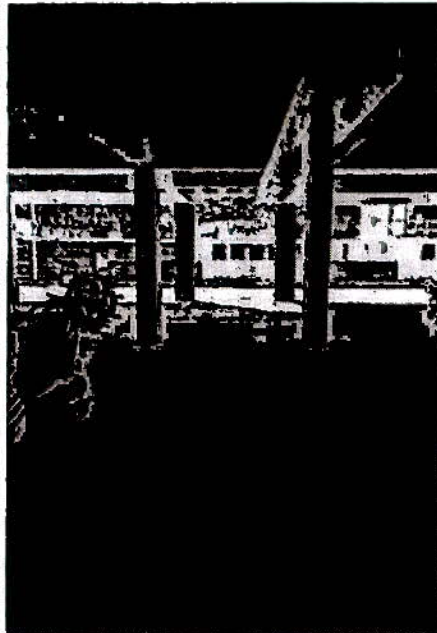
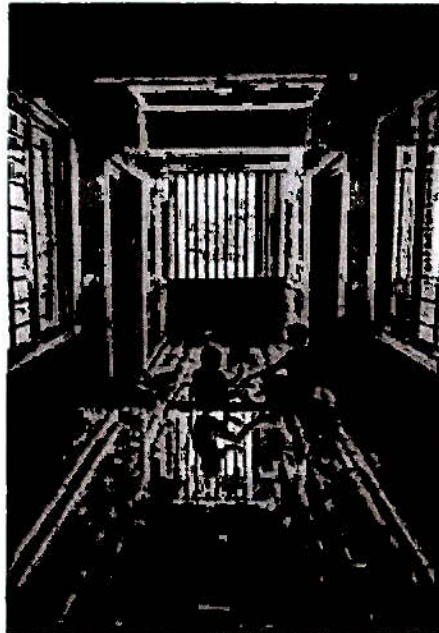
2.2.5 Features and Benefits

Housing features

A residential structure of G+4 was proposed with a dwelling unit area of 33.68 square meters with 8 such units (blocks A, B, and C) on each floor. As such, a total of 88 dwelling units has been built across 3 residential tours to house 87 families. The plan of the dwelling units can be referred from image 4. Each dwelling unit has a living, kitchen(with utility), bedroom, and a shared toilet and bath.

Basic services

The housing project gives access to water supply (individual overhead tanks) and sanitation to all the dwelling units. Since, a storm water drain for the complex was within the scope of the project, the necessary provisions has been made. As per TUDA zonal regulations, a rainwater harvesting system has also been installed in every block.



Public amenities

Each house is also provided with a 2-wheeler parking in the ground floor along with three-wheel rickshaw parking for drivers in the community. Provisions has also been made for a children's playground

Social infrastructure

The housing complex also houses a livelihood center, a community hall, and an Anganwadi on the first floor of the 'W' block. The livelihood center would help the daily wagers of the community (especially women) learn new skills to expand their livelihood skills. The community hall would be shared by the community for any special occasions or gatherings based on the request approved by the community association. The anganwadi would be beneficial for the growth and development of toddlers in the housing complex and helpful for working women in the community.

2.6 Key findings from the interviews, surveys, and primary/secondary data collection

The understanding and assessment of the redevelopment project are based on reading of technical documents, observation of the project site, and semi-structured interviews with various stakeholders of the project.

Key findings from semi-structured interviews and observation of various stakeholders are as below:

Residents

The questions for the residents of the housing complex are based on the access to basic infrastructure facilities(housing, water supply, sanitation, electricity), accessibility and availability of various amenities (drinking water supply, parking, open spaces, etc.), social infrastructure (anganwadi, primary health care centre, etc.), and condition of their land tenure post the development of the housing project. Below are the findings from the interactions with the residents:

- a. Most of the residents are happy with the facilities provided to them in terms of basic services like water supply, sanitation, and electricity.
- b. Residents responded positively to questions regarding their access to social infrastructure. They shared that the skill development center and Anganwadi within the residential complex would help the working mothers.
- c. The residents are provided with a land tenure for 30 years and the necessary documents have been handed over to the residents.
- d. Although there is a provision for an elevator for all the blocks, the residents are quite hesitant about using them for various reasons like children using the elevator and damaging the facility. Concerns has also been also about the electricity bill that would be shared by the residents.

Smart city officials

The questioners for smart city officials are based on the risks involved in the projects, the aims, and the difficulties they faced in achieving them. The key findings from the

interaction with the smart city officials are as below:

- The project initially faced difficulty in the procurement of the required land area which was overcome eventually.
- Gaining the trust of the residents is the most important criterion in the implementation of slum redevelopment projects.
- To make sure the residents cannot rent out the house provided to them to outsiders, the ownership was only restricted to 30-year tenure with cross-checking of residents by the officials.
- The residential complex has been handed over to the people by forming a resident's association as caretakers of the residential complex.

3. Discussion and Conclusion

3.1 Implications

Housing

Compared to the previous conditions of the people in the slum, most of the residents are satisfied with basic infrastructures like water supply, sanitation, and electricity in the newly developed residential complex.

Since the provision of secured tenure was one of the main aims of the project, residents have been given full ownership along with the necessary documents handed over to them. However, with the previous experience in the slum redevelopment projects, the authorities have concerns over the re-renting of flats to others by the beneficiaries. The smart city officials of Tumakuru, as an alternative to the problem, shared:

"To avoid the re-renting of flats by the beneficiaries, instead of providing them with permanent ownership of the flat/land we have provided them a secure tenure for the period of 30 years beyond which re-evaluation would be carried out and the tenure will be extended."

To prevent the re-renting of flats there would be periodic inspection from the concerned officials as well.

The size of the dwelling units has been fixed at 33.68 square meters as per the requirement of the EVVS unit seems to be insufficient for a redevelopment project with an average household size of 4/51 members. Although households with 3 to 4 members do not face any problems with the availability of space, there is a space constraint for households with more than 4 members.

Basic Infrastructure

Compared to the basic services that were available for the slum dwellers most of the residents are happy with the facilities they have been provided in the new residential complex. In the semi-structured interviews, most of the residents gave positive replies about the availability and accessibility to basic services like water supply, sanitation, and electricity. One of the residents Mr. Chakrapani said:

"We do not have any problems with respect to water supply, sanitation, or waste management in the new complex. However, we would like to have a drinking water supply unit nearby"

Drinking water supply is seen to be a common request by many of the residents.

Economic Impact

Most of the residents of the Mariyamanagar slum work as daily labourers in the nearby market, and the women as domestic workers.

One of the major support from the slum dwellers for the project is that the location of the site is in proximity to their working place and none of the Mariyamanagar slum dwellers is asked to relocate. This ensures that neither their daily jobs nor their income is affected before and after the project.

The creation of healthy residential conditions as in the

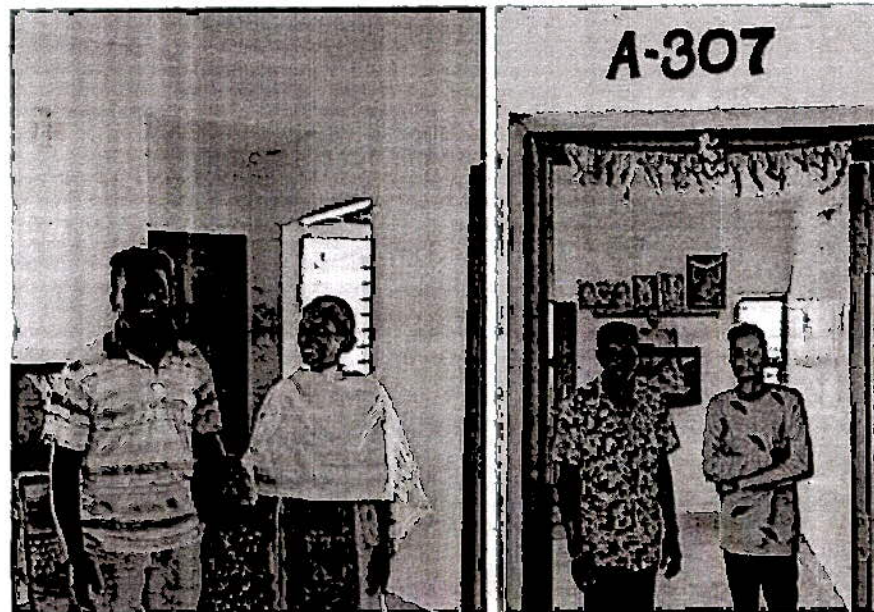
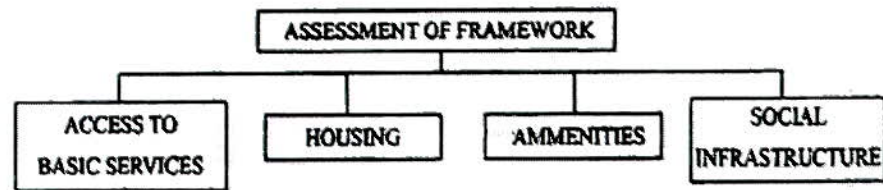
case of the redevelopment project also ensures a healthy lifestyle thus decreasing their yearly medical expenses.

However, since the provision of a residential complex is a change in lifestyle for the dwellers, they have expressed their concerns over the maintenance charges that would be levied on the usage of public amenities (lift, etc.) The member of the residential association Mr. Chakrapani was quoted saying the following regarding the lift maintenance:

"We have spoken to the MLA (member of legislative assembly) and he has assured us to provide the RO water supply unit nearby along with the lift maintenance charges to be covered by BESCOM"

Social Impact

The residents before the development of the residential complex had a temple as their social gathering place and an Anganwadi in proximity to the slum. Most of the residents are unskilled labourers who depend on daily



wages. Most of the residents were happy about the provision of Anganwadi in the same residential complex in Block A.

For the skill development of the slum dwellers (especially women), a livelihood centre has also been provided in the same residential complex. Although the centre has not been in operation yet, the women in the community are hopeful of learning new skills.

In the Block A of the first floor, a community centre space has also been provided for usage by any of the dwellers. One of the residents Mr. Annadorai is quoted saying:

"There is a small playground in front of the building. However, kids still play in the parking lot but since it's within the boundary of the building, we feel it's safer. There is a primary school nearby and parking space is provided to everyone in the ground floor and we are quite happy with the services provided."

SDG	Goal	Indicator
1	No poverty	Providing land tenure for slum dwellers can lift their economic condition
3	Good health and well being	Providing healthy living conditions with access to all basic services
5	Gender equality	Providing dwelling units for individuals irrespective of their gender
10	Reduced inequalities	Providing housing units for the slum dwellers would help formalise the informal settlement
11	Sustainable cities and communities	Bringing the informal settlements into the formal settlements

References

- Detailed Project Report on Housing and basic services for urban poor at Mariyamnagar, Tumakuru
- Slum Upgrading Legal Assessment Tool, Un-Habitat
- Evaluation of slum upgrading programs: Literature Review and methodological approaches: Laura Jaitman and Jose Brakarz; Inter-American Development Bank Nov-2013.

Impact on SDG's

The slum redevelopment project has the following direct positive impacts on SDG:

3.2 Limitations of the research

- Most of the data collection and analysis have been done on a qualitative basis. The semi-structured interviews conducted (6 residents) cannot be projected as surveys to represent the condition of the whole community.
- The opinions and data collected from the interviews may be biased.
- The quality of the residential complex building construction and other quantitative data have not been considered for the assessment.

3.3 Key lessons learned

- For any slum redevelopment project, the trust of the people on the government body/service providers plays an important role.
- In the current slum redevelopment project, since the dwellers were not asked to relocate during

the time of construction not much resistance was shown towards the project by the residents as seen in other slum redevelopment projects.

- Although provision of the amenities like elevators have been provided, concerns were expressed on who would maintain the facilities

3.3 Recommendations

- The Mariyamnagar slum redevelopment project has set ideal an example among the slum dwellers of the city of Tumakuru to trust the ULBs. Such pilot projects in every city could act as a catalyst in creating trust among people in the ULBs and other service providers.
- The provision of basic services like drinking water supply should also be considered in every slum redevelopment project.
- Undertaking stakeholder consultation will help to provide a better perspective on their requirements and maintenance.
- Along with the creation of a livelihood centre (as in the case of the current slum redevelopment project), a network of such centres within the city would help to provide better opportunities for the informal sector workers.

C24

Ring Road: Addressing Congestion in the City

TUMICUR

Name of the project: Use of municipal waste for redevelopment of Ring Road

Location: Tumaluru, Karnataka

Year of Project Implementation: 2019

Sector: Multimodal Transit under ABD area

SDG: SDGs: SDG 09, SDG 07, SDG 11, SDG 12 and SDG 13

Project Cost: Rs 68 40 crore (Rupees Sixty-eight crore forty lakh only)

Institute: Manipal School of Architecture and Planning

Advisors: Purushottam Kesari

Students: Mani Sanjay Shandil, K. DJ Vipul Vanishth

Keywords: Ring Road, Redevelopment, Right of Way Area Based development (ABD), Urban Mobility

Abstract:

The redevelopment of Ring Road was undertaken by Tamakuru Smart City Limited (TSCCL) to provide improved mobility and connectivity. The redevelopment of the Inner Ring Road was initiated due to the growing urbanisation that led to heavy traffic congestion in the ABD area.

The redevelopment of the Ring Road will also drive socio-economic growth and improve quality of life by enabling economic development. The project was intended to benefit Urban Mobility and Public Transport. The project will ensure smooth flow of vehicles by decongesting the traffic movement in the core areas of the city.

The objective of the report is to understand the feasibility of the redeveloped Ring Road. Few criteria and frameworks were adopted to evaluate the active means of utilisation through qualitative analysis in terms of interviews, questionnaires and documentation.

The report talks about the impact of redevelopment on end-users with regard to travel time, accessibility of public transport and availability of pedestrian infrastructure. The focus of the report is to understand and analyse the impact of the redevelopment on different user groups.

1. Introduction

Tumakuru, in South-east Karnataka, is an industrial city spread over 48 sq km with an ABD area of around 5.58 sq km. It is known as the knowledge hub of South Karnataka. The food and Agro-processing industry forms the major economic base. The city is close to the Karnataka state capital, Bengaluru which is located just 70 km South-west of Tumakuru.

The government of India intends to transform 100 cities under the PAN city and ABD proposals to give better public infrastructure and a decent quality of life to its citizen. Thus, Tumakuru was selected as one of the cities under the Smart City Mission. Smart City Limited has proposed the "Development of Smart Roads in Tumakuru Smart City" to allow integration and convergence with organisations and local governments to give solutions for the development of the city.¹

1.1 Topic and Context

Tumakuru, also known as the City of Education or the City of Coconuts, is an industrial city spread over

approximately 48 sq km. It lies in close vicinity to the Kempegowda International Airport, Bengaluru (86 km), Tumakuru Railway Station and Yeswanthpur Railway Station, Bangalore (63 km). Tumakuru has a ready industrial infrastructure that is distributed throughout the seven Industrial Parks and seven Industrial Estates, serving 37 major and medium enterprises.²

Demographic and Geographical context:

1. Area: 48.21 sq km
2. Population density: 6300/sq km
3. Population of the ABD Area: 43,941
4. ABD Area: 5.48 sq km
5. City Population: 3,05,621 (2011 Census)

The city has been selected for the smart city mission. The projects therein will be carried out at two levels - ABD and PAN city with ABD (Area-Based Development) focusing on city improvement, city renewal and city extension and PAN city level that envisages the deployment of chosen smart solutions for the city's current infrastructure.

Tumakuru's ABD project is centred on retrofitting of around 1400 acres in the CBD (Central Business District) area, as well as other interventions to decongest the city centre and update the current infrastructure and services. One of the projects identified under the Tumakuru smart city plan was "Redevelopment of the Ring Road". The project is evaluated under ABD projects which was initiated in 2019 and completed in 2020.

1.2 Scope of the Project

The redevelopment was initiated earlier as the Ring Road was frequently damaged due to stagnation of storm water and waterlogging at certain areas of the stretch that lead to traffic congestion and an increase in the number of road accidents. The redevelopment was undertaken to upgrade the existing condition of the Ring Road in the interest of the general public.

The redevelopment is intended to reduce traffic congestion and road accidents, improve air quality and increase durability of the current road infrastructure.

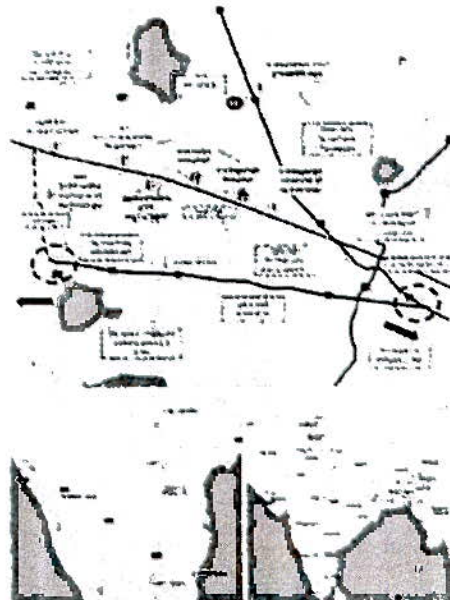


Figure 1: Location of Tumakuru and Inner Ring Road
Source: Author

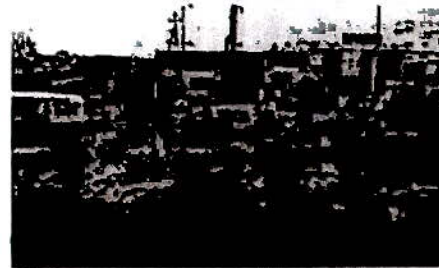
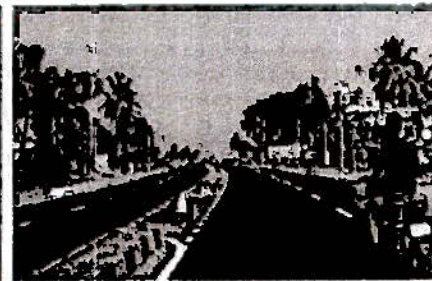


Figure 02: Pre-existing condition of the Ring Road, Source: Detailed Project Report



Figure 2: Pre-existing condition of the Ring Road
Source: Detailed Project Report



¹ Tumakuru smart city limited. (2018). Detailed project report on rejuvenation and redevelopment of ring road, Tumakuru.

² Tumakuru smart city limited. (2018). Detailed project report on rejuvenation and redevelopment of ring road, Tumakuru.

The project consists of land acquisition for 45-meters right-of-way for a distance of 10.50 km.

The report will investigate and address problems such as traffic congestion and pedestrian infrastructure through contextual background, qualitative assessment through interviews and risks and challenges involved in the completion of the project.

The report attempts to analyse the project using the above-mentioned issues as a framework to identify shortcomings in the planning and execution processes.

1.3 Significance of the project

The development of the Ring Road will help to decentralise the traffic issues because most of the traffic heading to Honavar uses the inner city core areas. This causes traffic accumulation in the city centres increasing the city's traffic intensity and congestion.

The said development will increase accessibility to public infrastructure, availability of dedicated right-of-way and provision for service lanes that will enable local area development.

The suggested restoration and upgradation of the Ring Road will give an advantage to the ABD area such as decentralising traffic, fewer accidents, improved air quality and increase in the long-term visibility of the city's existing transport infrastructure by redirecting undesirable traffic to the ABD area.

The project intends to improve mobility by creating means of utilisation by decentralising commercial activity to outlying locations. In addition, the project also allows quick access to important nodes through a comparatively faster commute. The project will substantially reduce travel time. The improved road will also provide other benefits such as provision for service lanes, footpaths, street lights as well as improve the economic status of the people living in the fringe areas.

Furthermore, the project will also utilise recycled municipal waste as base material for the construction to make development sustainable.

1.4 Aim and Objectives

The study's goal is to examine the current state of the Ring Road in consideration of the problems and challenges outlined in the smart city plan. The evaluation will be carried out within the scope of detecting concerns along the chosen length and assessing them in relation to various factors.

Objectives of the research

1. To analyse the impact of the newly developed Ring Road on end-users.

2. To understand the advantages and disadvantages of redevelopment.
3. To assess the redevelopment in consideration of the sustainable development goals and their relevance to the project.
4. To identify issues and gaps in implementation, if any, and to provide recommendations for the same.

2. Contextual Background

The existing Ring Road also known as the Inner Ring Road, was one of the projects undertaken by the Tumakuru Urban Development Authority (TUDA) with financial assistance from Karnataka Urban Infrastructure Development Finance & Corporation (KUIDFC) under ADB loan during 1997-98. The maintenance of the road was poor due to a shortage of funds. The rejuvenation and redevelopment of the 10.5 km of the Ring Road was not in the original proposal of the Smart city project. TUDA approached the Smart City Mission¹⁴ to redevelop the road under the said project.

The 10.5-km Ring Road runs from Kyatasandra to Gubbi. Due to heavy overloaded vehicular traffic the

road surface has deteriorated and potholes and ruts have been formed over the said stretch. The poor condition of the Ring Road has also been caused by waterlogging and lack of cross drainage. Due to lack of proper signage, street furniture, signalling, footpaths and cycle tracks most of the traffic heading to Honavar from Bangalore did not use the Ring Road and instead took the route through the core area of the city. Traffic in Tumakuru increased as a result of the vast industrial sector in Vasanthanarasapura and the HAL Helicopter manufacturing unit in Gubbi. Several major educational institutions and hospitals (including District Hospitals) are currently located along the NH-206. This generates heavy traffic resulting in congestion and frequent accidents making it accident-prone zones.

Another reason for the Ring Road's redevelopment was the current NH-206, which not only serves as a transport link for the traffic heading to Arasikere, Tiptur, Shivamoga and Honavar, but it also runs through the heart of the city and has a carriageway width of only 15 metres, which is insufficient to meet the current and future traffic demands.¹⁵

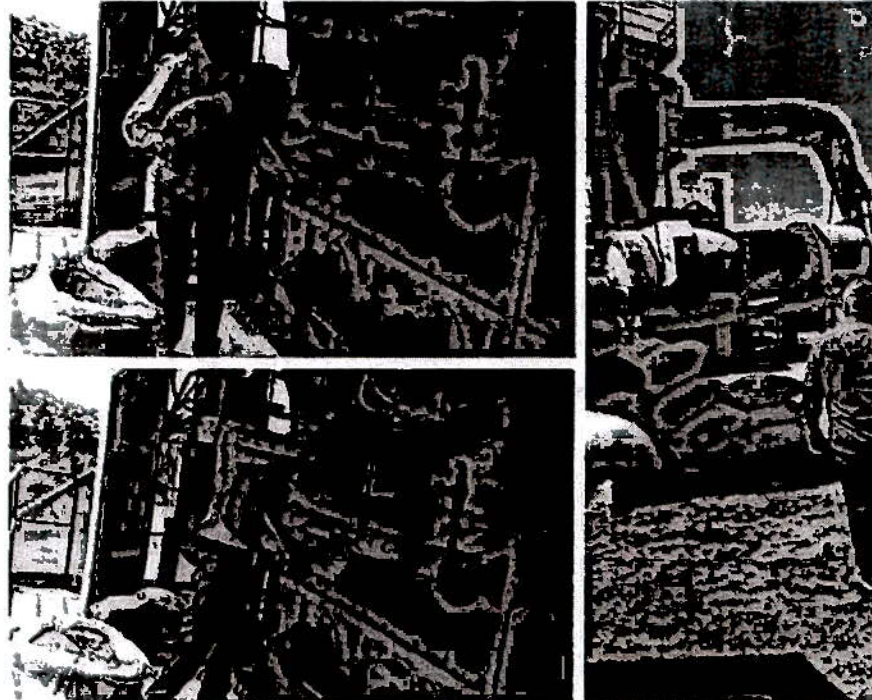


Figure 05: Recycling of municipal waste. Source: Smart city limited

¹⁴ Tumakuru smart city limited. (2018). Detailed project report on rejuvenation and redevelopment of Ring Road, Tumakuru.

¹⁵ Tumakuru smart city limited. (2018). Detailed project report on rejuvenation and redevelopment of Ring Road, Tumakuru.

¹⁶ Tumakuru smart city limited. (2018). Detailed project report on rejuvenation and redevelopment of Ring Road, Tumakuru.

By diverting the unwanted traffic from NH-206 (Bangalore – Honnavar) and SH-48, the proposed rejuvenation and upgradation of the Ring Road will benefit the ABD area by reducing traffic congestion and accidents, improving air quality and increasing durability of the existing road infrastructure.

2.1 Conceptual Framework/Research Design

The goal of the study was to determine the impact of the Ring Road on end users. Surveys, questionnaires, response analysis and conversations with Tumakuru smart city authorities, site engineers and project management consultants were used to gather primary data. Discussions were also held with key stakeholders including industrialists and local communities to better understand the primary and secondary demands.

A non-experimental, empirical research design was adopted for the study. The Tumakuru Smart City Authority contributed the core data in the form of documents and drawings. The primary data was collected through site visits, observations and photographic documentation. A convenience sample of adult men and women was used to obtain secondary data. The specified age criteria of 18 years and above was considered to reflect a higher level of awareness of the project's socio-political and economic context. The questionnaire was created based on project satisfaction and future ambitions and expectations.

The Questionnaire for semi-structured interviews is covered in Annexure 1.

2.2 Key features of the project

2.2.3 Challenges in the project

i. Land acquisition

To meet the expected future traffic demand, land had to be acquired for road widening. The Tumakuru Urban Development Authority (TUDA) faced significant challenges in acquiring land.

ii. Relocation of vendors

It was a tough challenge for the authority to relocate the vendors who had encroached on footpaths and carriageways of the land required for acquisition. This also led to conflicts between smart city authorities and specific groups of people.

iii. Working with a specific group of people

Due to a conflict of interest, working with a specific set of people was challenging. The residents were concerned about the land that was being taken away from them.

iv. Realignment of electric poles

The previous laid electric poles had to be adjusted in accordance with the new road layout. Relocating the poles without causing any damage was a big challenge, particularly considering the project's time constraint.

2.2.4 Risks involved in the project

i. To gain people's trust, the project had to be completed within the stated timeframe, any delays would reflect poorly on the initiative.

ii. Theft of construction material was noted on a section of the route. As a result, the construction process slowed down.

2.2.5 Features and Benefits

i. Local employment was created during the construction phase, providing financial assistance to the underprivileged in the area.

ii. The rejuvenation and upgradation of the Ring Road provided benefits to the ABD area such as relief in traffic congestion, decrease in accidents, better air quality, increase in durability of the existing road infrastructure by diverting unwanted traffic of NH-206 and SH-48.

iii. In order to meet intra-city transportation needs, the redevelopment assisted in enhancing mobility and accessibility within neighborhoods, wards, zones and suburbs.

2.6 Key findings from interviews, surveys and primary/secondary data collection

The project's evaluation was based on qualitative techniques which included document reading, observations, questionnaires and interviews. All these methodologies were used to determine the project's basic infrastructure, socio-economic impact, accessibility and feasibility.

Documents (Primary Data)

▪ Detailed knowledge about the project was gained after reading various documents which were shared by the smart city authority.

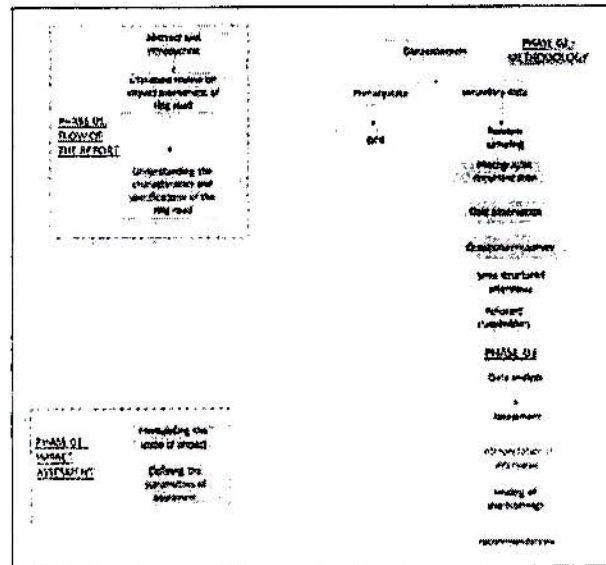


Figure 2: Pre-existing condition of the Ring Road
Source: Detailed Project Report

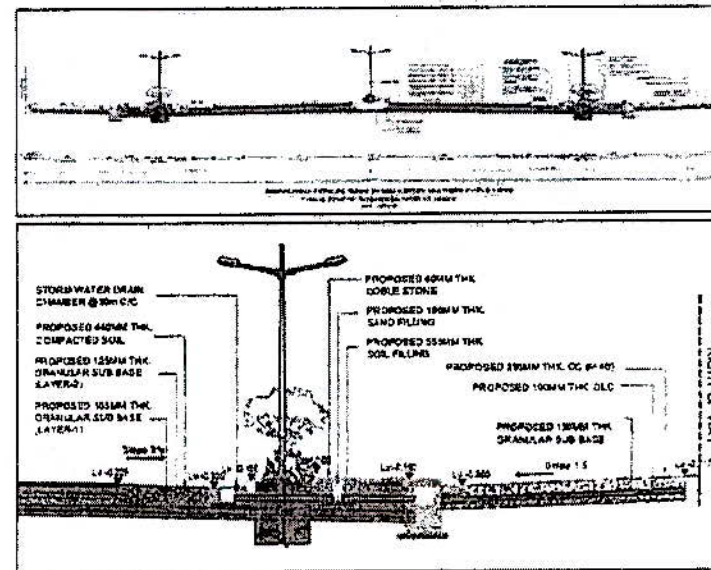


Figure 07: Detailed blow up of service road, drains, footpath and curb
Source: Detailed project report

Key findings from the semi-structured interviews and observations of various stakeholders.

Industrialists and end users

The questionnaires for stakeholders and end-users (pedestrians and vehicle drivers) were asked regarding access to the road, feasibility and provision of basic infrastructure (footpaths, foot-over bridges, cycle tracks, parking facilities).

- Most of the industries located along the Ring Road were satisfied with the redevelopment as it aided in easy transport of their goods with a decrease in travel time. However, a common request from them was for provision of dedicated parking spaces for their private vehicles.
- People responded positively to the questions relating to traffic decongestion, travel time and road condition. But the common point of discussion was the lack of pedestrian infrastructure.

Smart city officials

The questionnaire for the smart city officials was based on the risks involved in the project, aims, objectives and difficulties faced during the execution of different phases of the project. The key findings are:

Discussion with the project engineers and project management consultants helped to get information about the use of municipal waste as a base material for construction, maintenance and operational authorities and co-ordination with TUDA (Tumakuru Urban Development Authority) for land acquisition.

The main challenge was land acquisition as certain groups of people opposed the project which led to conflicts and some illegal activities like theft.

After talking with the site engineer, detailed knowledge about the reuse of municipal waste was gained. Recycled aggregates were then used as a filling material below the asphalt layer.

The main focus of the project was on redevelopment of the Ring Road to decongest the core city area and pedestrianisation was the secondary aim of the project.

3. Discussion and Conclusion

3.1 Implications

The impact assessment of the project is based on the socio-economic impact, basic infrastructure, accessibility and feasibility.

Socio-economic impact

- i. Before the redevelopment of the Ring Road, some sections of the road were facing illegal encroachment by certain groups of people that catered to their livelihood. The encroachment at the edges of the road included engagement in activities like extending the display area of the shops, garages etc.

- ii. Even though the land had already been acquired by TUDA, few people were not willing to give up their respective shops and garages.
- iii. The redevelopment of the Ring Road led to commercialisation and an increase in the land cost of the surrounding area.

Table 1: Impact Assessment method

PARAMETERS	INDICATOR	ASSESSMENT METHOD
Road user- Pedestrian	Accessibility of pavement Access to public transport Availability of zebra crossing Provision of footover bridges Shading of the pathways Health and safety	Questionnaires and observation
Road user- Vehicular	Saving in travel time Reduced chances of accidents Traffic decongestion Problems of heavy traffic jam Saving of fossil fuel Alternative travel roads	Questionnaires and observations
Local stakeholders/ community	Employment opportunities Community engagement Provision of on street parking Overall economic growth Impact on private assets Formal and informal industries Pressure on supply of local services	Questionnaire/ Data collection
Road infrastructure	Reduced crime and ill activities Addition of service lanes Feasibility of carriage way Major/ minor junctions Road markings Addition of curbs Right-of-way Civil works	Observations

Basic infrastructure

- i. Comparing the services and utilities mentioned in the DPR like provision for footpaths, street furniture, road crossings, cycle tracks, traffic signals and green belts, some of them were missing.
- ii. After discussing with the site engineer about the above-mentioned shortcomings it was suggested:

The main aim of the project was to decongest traffic, footpath and pedestrian infrastructure will be added in the up-coming days

Accessibility

- i. The project has helped substantially in connecting the nearby towns - Gubbi, Honavar, Kunigal by enhancing the intra-city transportation link.
- ii. The redevelopment has:
 - a. Reduced traffic congestion
 - b. Reduced travel time

The vehicular traffic had easy and fast access to infrastructure however, the stakeholders along the stretch were not provided with dedicated access to their respective shops in terms of parking. As a result of which, the service lanes are partially filled with the private cars of the stakeholders.

Impact on SDGs

An impact assessment was done considering the sustainable development goals which was based on data collected through primary and secondary sources. Here direct positive impact is the immediate consequence of putting the case into action. The indirect positive impact was the effects that may happen as a result of the implementation.

The Ring Road Redevelopment project has direct positive impact on the following SDGs:

SDG Number	Goal	Indicator
7	Affordable and clean energy	Recycled material was used for pavement surfacing and underlying layers, which adds to a clean environment.
11	Sustainable cities and communities	The reuse of waste led to creating awareness among the local communities and set an example for the neighbouring cities
12	Responsible consumption and production	Reuse of the solid waste for construction created awareness about production and consumption of products and services

The Ring Road Redevelopment project has indirect positive impact on the following SDGs:

SDG Number	Goal	Indicator
3	Good health and well being	Providing healthy living conditions with access to basic amenities in and around the stretch that will contribute to overall healthy communities
13	Climate action	The reuse of the solid waste for pavement surfacing and underlying layers will contribute to the health and safety of the community

3.2 Limitations of the research

- Access to the samples was restricted due to opposition from specific groups of people.
- Additional information like traffic surveys could not be undertaken owing to time constraints.

3.3 Key lessons learnt

- Priority should be given to public participation during the planning stage to avoid conflicts while executing the project.
- The current project only focused on improving road infrastructure and not all requirements of the local stakeholders and community.
- By providing additional routes for traffic, and decentralising traffic movement from the existing, heavily jammed routes in the city center. As a result, Ring Road relieved congestion by reducing strain on the city's core routes.
- The Ring Road was initially planned for decongestion of traffic from the core areas of the city but at the same time, it has also increased the traffic count/ flow in the outlying areas which led to increase in demand for new roads away from the city centres. Thus, it can be said that building more ring roads won't actually reduce traffic congestion issues in the

long run, but will actually induce and increase a new car user that will lead to a degraded environment and generate traffic.

3.4 Recommendations

Conceptual phase

- i. Involvement of all stakeholders should be prioritised.
- ii. Planning for plantation beds should be done considering the climate of the city.
- iii. Monitoring the environment to control pollution levels.
- iv. Dedicated parking space should be provided for the existing stakeholders along the Ring Road as at present people are parking their vehicles in the service lanes.

Design phase

Multimodal transport options can be planned.

- i. Though the primary objective of the project was to connect the two main junctions to decongest the traffic in the inner-city area, the pedestrian infrastructure could have been equally prioritised considering future development along the Ring Road.
- ii. Proper infrastructure for pedestrians like foot-over-bridges and footpaths could have been provided.
- iii. Provision for dividers after certain intervals should be

done.

- iv. Bus stops and rickshaw stops should be provided at regular intervals.

Implementation phase

- i. Provision for street furniture and facilities like rickshaw stops and bus stops should be done.
 - ii. Increasing the ease of navigation by making the road more legible through improvising the existing and introducing new street signages and markings.
 - iii. Tree plantation should be proposed along the stretch to provide shade to the footpaths.
 - iv. Markings of basic amenities like petrol pumps, gas stations, maintenance services etc. should be done.
 - v. Specifying the speed limit as per typology of the vehicles.
- i. Tumakuru smart city limited. (2018). Detailed project report on rejuvenation and redevelopment of ring road, Tumakuru.
 - i. India smart city mission. (n.d.). The smart city challenge: Stage 2, Ministry of urban development, Government of India.
 - i. Kumar, S, Koduru, K, Venigalla, A, & Marupilla, DS. (9 May 2016). Environmental impact assessment of the proposed outer ring road project for new capital of Andhra Pradesh, India. International Journal for Technology Research In Engineering.

References

1. Tumakuru smart city limited. (2018). Detailed project report on rejuvenation and redevelopment of ring road, Tumakuru.
2. India smart city mission. (n.d.). The smart city challenge: Stage 2, Ministry of urban development, Government of India.
3. Kumar, S, Koduru, K, Venigalla, A, & Marupilla, DS. (9 May 2016). Environmental impact assessment of the proposed outer ring road project for new capital of Andhra Pradesh, India. International Journal for Technology Research In Engineering.

GENERAL INFORMATION	
1	NAME
2	Age Group
	a. 18-24
	b. 25-34
	c. 35-50
	d. 50 and above
3	Occupation
	a. Student
	b. Job
	c. Self employed
	d. Retired
	e. Other
4	Purpose of travel
	a. Educational
	b. Workplace
	c. To nearby residential area and amenities
	d. Other
5	Mode of Transport
	a. Public Transport
	b. 2-wheeler
	c. 4-wheeler
	d. Pedestrian

QUESTIONNAIRE	
A.	PEDESTRIANS
1	Are foot-over-bridges present? If yes, do you use them?
	a. Yes
	b. No
2	Is there proper access to Bus stops and Rickshaw stops?
	a. Yes
	b. No
3	Are subways present? If yes, do you use them?
	a. Yes
	b. No
4	Are you satisfied with the infrastructure provided for pedestrians? (footpath, zebra crossings, subways, foot-over-bridges)
	a. Yes
	b. No
5	Rate the infrastructure on the basis of quality and accessibility.
	a. 0-2
	b. 3-5
	c. 6-8
	d. 9-10

B.	VEHICLE USER
1	<i>Has the road condition improved than before?</i>
	a. Yes
	b. No
	<i>If yes, rate as per the given scale</i>
	a. 0-2
	b. 3-5
	c. 6-8
	d. 9-10
2	<i>How has the development of the Ring Road impacted you in terms of reduction in travel time?</i>
	a. High
	b. Medium
	c. Low
	d. No impact
3	<i>How clear and visible are the road signs and road markings?</i>
	a. Clearly visible and maintained
	b. Somewhat visible, need to maintain
	c. Not visible
4	<i>How often do you take this Ring Road to your destination?</i>
	a. Daily
	b. Most of the time
	c. Only for work
	d. To access the amenities around the Ring Road
	e. Not so often
C.	FOR BOTH PEDESTRIANS AND VEHICLE USERS
10	<i>How will you rate the redevelopment in terms of road safety aspects like dividers, markings, signals?</i>
	a. 0-2
	b. 3-5
	c. 6-8
	d. 9-10
11	<i>What are the impacts of the project on the traffic on the adjacent road network?</i>
	a) Less traffic congestion
	b) More traffic during peak hours
	c) No change
15	<i>Has the redevelopment increased easy access to the markets and services?</i>
	a. Yes
	b. No
	c. Maybe
16	<i>Which areas does the Ring Road connect? Does it connect to major cities or large administrative centres?</i>
	a. Yes
	b. No
17	<i>What do you feel about the condition of the road surface?</i>
	a. Unmaintained road surface
	b. Potholes
	c. Slippery road surface
	d. No pavement markings

19	Rate the access and accessibility to public facilities like petrol pumps, public toilets, ATMs and public transport?
	a. 0-2
	b. 3-5
	c. 5-8
	d. 9-10
20	How long is your average commute to work through this Ring Road as compared to the travel route from the core area of the city?
SURVEY	
3	What do you feel about traffic safety?
6	At what time is the major traffic congestion?
	a. Office time
	b. Closure time of schools
	c. Location of toll plaza
	d. Bad road condition
8	How accessible are public amenities like petrol pumps?
	a. Quite accessible
	b. Not so accessible
9	What do you feel about the condition of the pavement?
	a. Accessible and maintained
	b. Accessible but not maintained
	c. Not accessible
12	Do you prefer the Ring Road or alternate travel routes?
	a. Never
	b. Sometimes
	c. Often
	d. Very often
	e. Always
14	Has the development of Ring Road helped in traffic decongestion?
	a. Yes
	b. No
OBSERVATION	
1	How has the development of the Ring Road affected the smart growth policy?
2	How effective are the bicycle and pedestrian connections?

C35

A case of Kalyani Honda and Clock tower, Durgambika Temple Precinct, Davanagere Karnataka

Davanagere

Name of the project: Natural and Cultural heritage. An opportunity to integrate social identity of the place - A case of Kalyani Honda and Clock tower, Durgambika Temple Precinct, Davanagere Karnataka

Location: Davanagere

Sector: Urban Infrastructure

SDG: SDG 11

Institute: RV College of Architecture, Bangalore

Advisors: Prof. Jyoti Rao, Ramesh Krishna, Dr. C.P. Nayak

Students: Ms. Harshita G, Ms. Meera

Keywords: Social Cultural, Area Based Development

Abstract:

Natural landscape of the city defines its geographical interface with the nature in which people relates and identify the cultural connection. In the changing time and space, these associated identities re-establish its identity in new diverse socio-cultural context. Nature and culture of the place along with the people believe system connects to the emotional and nostalgic identity* of the place. Smart city project in Davanagere explores the natural and cultural heritage of the historic precinct near Durgambika temple and demonstrate the revival of Honda¹ which brings back the old association cultural value with the natural heritage of the place which is lost due to the development. It also demonstrates the importance of Inclusive approach in program that relate to cultural, natural heritage with economic overlay of the place.

*Definition of nostalgia: a sentimental longing or wistful affection for the past, typically for a former home or period of one's life. It is a form of sentimentality that reflects a sense of loss, longing, melancholy, or yearning for the past.

1. Introduction

Davanagere once it was called as place of many lakes, the city is built around the natural systems such as lakes which also found suitable for traders/travelers established Davanagere as one of the cities of trade importance which connected Bangalore in the south and Hubli/Dharwad in the north. In this region, Water body exist in many forms and condition such as various natural condition it possess Such as open pond (also called as Honda in kannada which is basically used for irrigation, house hold activities and animal cleaning/ drinking purpose. Some refer it as Pushkarani which

lotus pond)maidan (open space) generally part of the extension of the lake during dry season.

Historically, these conditions influenced to flourish trade and cultural activities such as animal fair, cultural events, informal market etc, the location and cultural significance of the precinct influenced trade that related to cotton, oil and small-scale industrial products etc, the economic, cultural activities influenced area around the inner core part of the city Durgambika temple precinct, Davanagere, over the period of time precinct has developed in to trade and economic hub which led to the issues relates to traffic, pedestrian, parking etc. which

impacted the image and socio-cultural engage with the open space.

this precinct has been selected to implement the project under the smart city ABD (Area Based Development). This project identifies two heritage nodes to address the issues related to development within the heritage precinct of Durgambika temple node and around the clock tower a heritage structure.

2. Core Enquiry

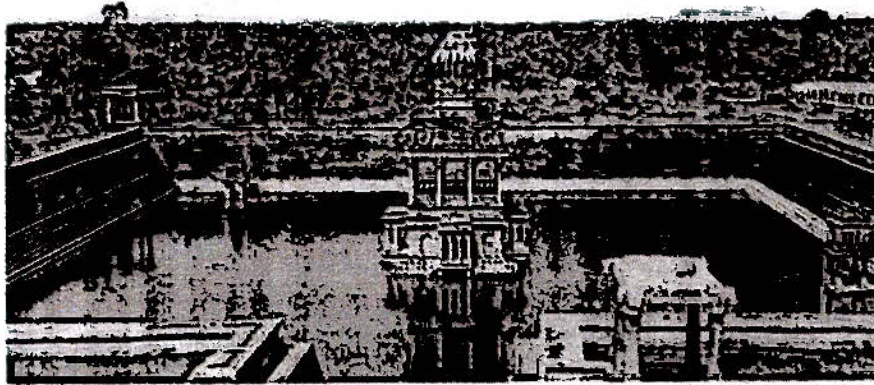
This documentation of the smart city project highlights the importance of Natural and Cultural heritage of the place in influencing the program and design of social space for the city.

2.1 Understanding of the Natural and Socio-Cultural layer of the region and the city:

As per the name Davanagere itself brings its strong relation with the socio cultural and Natural heritage. Ecology is seen as significant element that integrates with the cultural layer of the place. for example, it is found that there are many man-made water bodies/ Kalyani found nearby vicinities. It has significance of cultural and political history of the region.

The precinct of Durgambika temple located in the old cultural and commercial core of Davanagere which had neglected Kalyani Honda more than 100-year-old (water body or pond with access with steps) which is misused badly. (As per chief engineer of Davanagere City Corporation it was used by children for swimming and animal drinking purpose) Hondada circle is one of the main node where the road connecting village called Kondalji one of the village connecting historical region during Chalukya period and towards south it connects the famous Santhebennur another historically significant place famous because of Large Pushkarani (lotus pond) built during 16th century, the Palegara' Kenga Hanumantappa Nayaka from Nayaka dynasty. This informs the importance of access to Hondada circle historically and also connects the Doddapete one of the main commercial spines of the old part of the city.

There are many communities and their economic/ religious structure is located within this precinct, as many as more than ten temples related to different community exist Such as Kalikamba Temple, Venkateshwara Temple, Durgambika Temple, Mata Annapporneshwari Temple, Sri Nimishamba Devi Temple, Mylara Lingeshwara Temple, Sri Veerabhadreshwara Temple, Gorvrasandra Maramma Temple, Durgamma Mariyamma Temple, Durga Devi Temple, Sri Vasavi Kannika Parameshwari



(Santhebennur Pushkarani) (Lotus Pond) source of the image: Deccan herald news <https://www.deccanherald.com/content/5572866-masterpiece-stone.html>

For Mr. Ravindra B. Malakar MD of smart city, the project is to connect the requirement of current reworking such as leisure space, park or open space, entertainment with fountain. For Chief engineer, goes back to the memory of how kids use to play with water swimming etc, according to Mr. Hanumanth Rao Jadhav local resident stays very close to the Kalyani Honda and within the precinct of Garadi mane. A traditional gymnasium in this region which is popular activity among the youth, which has rich long history and importance in shaping the youth and culture of the place. The Kalyani and surroundings were part of the larger Nalish (storm water drainage network- Nalish means open drain- natural storm water drainage.) once used as large maidan as social gathering space. This place was used predominantly as weekly animal market which include such as cow, buffalo, goat etc. the richness of such places so that it reflects in the how each person use the place and its identity.



Garadi Mane entrance (Image: Author)

¹Palegara- feudal title for a class of territorial administrative and military governors appointed by the Nayaka rulers of South India - [https://www.google.com/search?q=palegara+news&rlz=1C1CH8F_en2977N9776cq+palgara+news&saq=chrome:69US70S12.3878\(Q\)1SS&sourceid=chrome&uTF=8-](https://www.google.com/search?q=palegara+news&rlz=1C1CH8F_en2977N9776cq+palgara+news&saq=chrome:69US70S12.3878(Q)1SS&sourceid=chrome&uTF=8-)

Temple. The major mosques are located in Azad Nagar, Vinoba Nagar, Imam Nagar, PB Road, KTJ Nagar. There are two churches in the city. These are located at P-J Extension K.R. Road, and Jayanagar. This shows the diverse community and their cultural practice in the region and place.

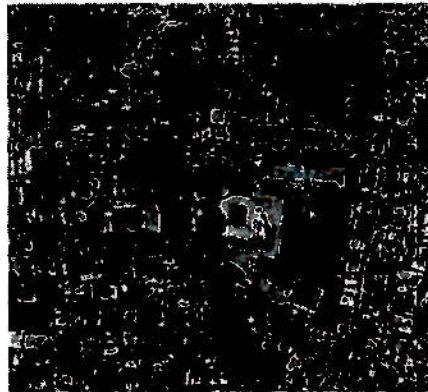
The changing cultural and natural heritage and its association with the community is significantly changed over the period of time. This predominantly because of the change in the demographic pattern and their engagement with the economic activities such as importance to cotton and related. one of the important time lines was when there were many cotton mills were established in this town. And once Davanagere was called as Manchester of Karnataka

2.2 Natural heritage

The old city of Davanagere A large storm water drain (Nullah) runs around the old part of the city. Open spaces along this drain indicate the cultural activities such as agriculture, maidan (Kalyani Honda and large open space around is part of cultural activity such as animal fair) and play area/gathering space during festival etc. existing Kalyani Honda and open space around was part of ecological network over the period of time it was used for cattle fair².

3. Introduction to the Context

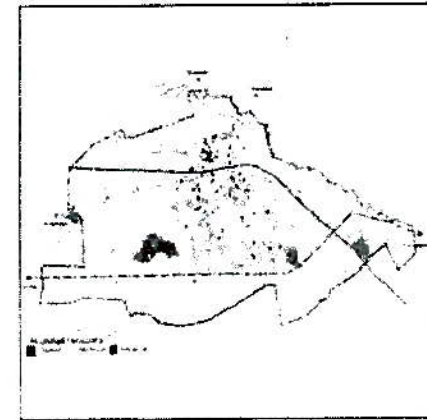
Hondada³ circle area which is part of old core of the city also known as Durgambika temple Precinct, consists of 2.5 acre of land partly owned by Durgambika temple trust and Davanagere City Corporation. Hondada circle and the area has social and cultural infrastructure such as public toilet, bus stop, schools, water tank, Garadi



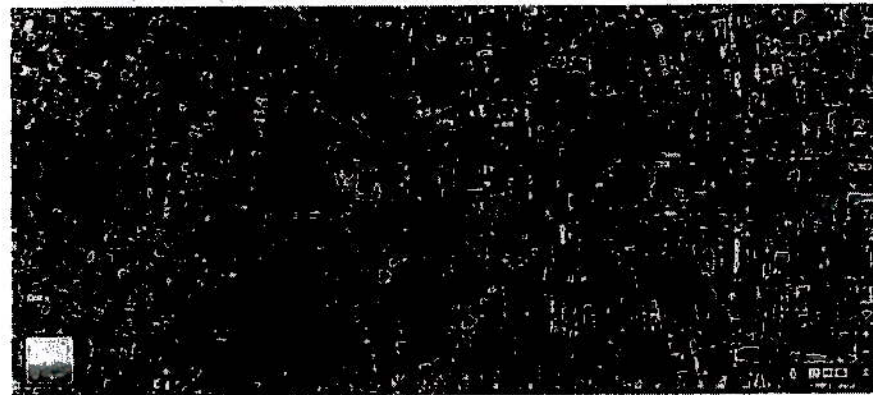
Location of Hondada circle where Doddapele street (main economic spine of the city) and Kalyani Honda.



Davanagere-CONTEXT



Broader socio cultural context of the city and Natural system



Precinct showing Hondada circle and its connection with old cultural and economic core of the city



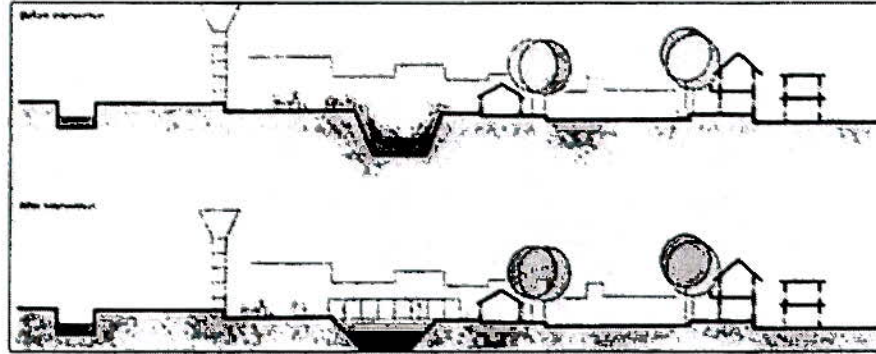
Site image showing newly built Kalyani and its spatial and social reference

²Cattle fare: Place where cattle were sold or exchanged. It is the place where large animal gathering in an open space, generally part of the natural system along with availability of water for the cattle to bath and drink.

³The pond/either Natural or man-made



Plan Showing the Context



Section showing Before and After the project implementation

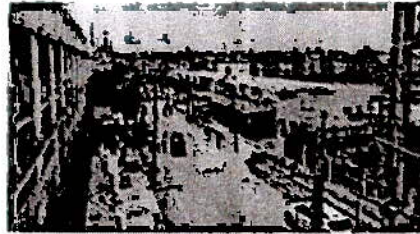
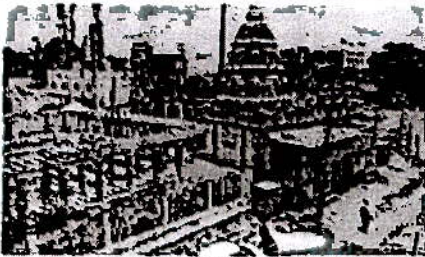
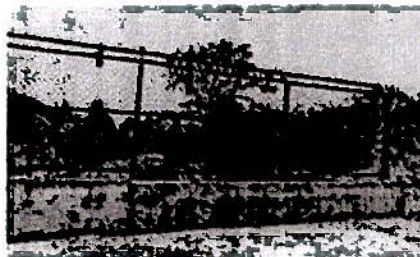


Image showing edge condition of the project. (Image:Author)



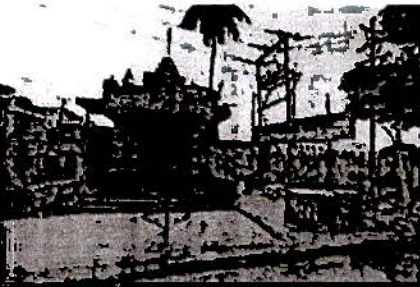
Old Image of Honda (author- Smart City Project reprint)
Kalyani Honda-after Smart City project



Nalla that runs along the west edge of the site (Image:Author)



Entrance steps to Kalyani (Image:Author)

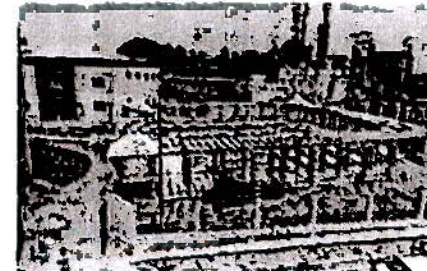


Religious typology (Image:Author)

Mane⁴, temple, formal and informal commercial. A Nalla⁵ adjacent to this land runs on the west side of the land which is owned by temple trust and Davanagere city corporation and it connects to the city level water network including lakes and storm water. This created smaller pockets of open space and green network connected with the communities and their cultural practices towards this natural heritage. also, It behaved as transitional space for the traveler/animals to rest and move forward to the next town. Animal fair is the one event that emphasize the cultural significant of the space and built around it. Many religious institutions such as Durgambika temple celebrated once in a year by the entire city where cultural and social activities are celebrated in such open space. Doddapete⁶

The Nullah that nearly runs around the old precinct of Davanagere creates many smaller open spaces around old town which is associates with the cultural memory of the place, they used as Maidan, playground, cattle fair, parks etc.

Smart city project intends to make this project as city level recreational urban space. There are two project area identified to take up under smart city project within the Durgambika heritage and cultural precinct (old core of the city) first project that include



Kalyani Honda, Honda Circle

⁴Wrestling area generally dedicated to lord Hanuman

⁵Nalla- Natural drain system/stream

⁶Doddapete- Main street with market related economic activities

1. Cultural intervention at Hondada circle
2. Heritage intervention at Clocktower near Mandi Pete market

After the project intervention

4. Risk and challenges during Implementation

Making of program as part of the intervention was a challenge faced during the implementation of the project. As clearly the precinct offered diverse community as stakeholders made the project challenge to finalize the program for both the project. Following are the challenges that faced during the implementation of the project

4.1 Social Inclusivity

The land was belonged to the Davanagere City Corporation and Durgambika temple trust. The cultural identity and associated values of the communities played an important role in deciding the intervention program for the place. this include reviving the Honda as social space, making of garden for the community, conservation clock tower as of the heritage structure and enhance the use of the garden around the clock tower.

4.2 Technical issues relate to project and program

As informed in the beginning the precinct is part of the natural heritage and the goal of intervention in the system can be achieved only by understanding the system well and come up with the right intervention approach. Behavior of natural system during critical period and taking that as an advantage to create entertainment aspects in design of social public space.

4.3 Integration of community aspiration

It is found difficulty in considering the aspiration of the communities around the precinct. Such as people who are involved in informal economy and cultural/ youth organization such as Garadi Mane (Gymnasium in Kannada) who are involved in one such traditional sports of the region.

5. Project Description

Smart city Davanagere identified Two Heritage precinct Durgambika temple precinct and clock tower area under Area Based Development. There are many other ABD projects focused on bringing new experience in use of these heritage structure and its image, that completed under the SCP. Such as Smart Road and ICT based projects relating to the energy, infrastructure and environment.

As per DPR "Specific to the design for the Kalyani Park envisages an inclusive design that caters to the renovation of defunct heritage structure, proposed amenities block as well as park / open space, transforming it into a multi-use space that is flexible

for use throughout the day and year. The design of the park attempts to focus the attention of the viewer and passer-by on the Clock Tower and emphasise the same as a landmark for the city."

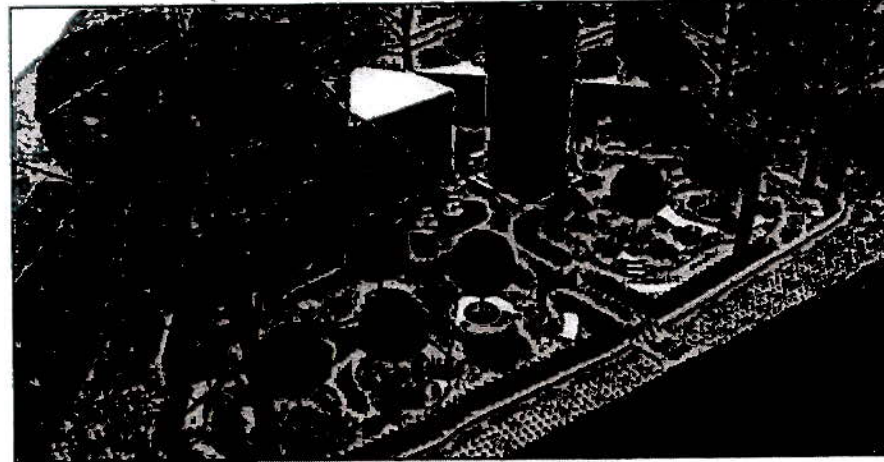
6. Intervention adopted/ Implementation methodology

6.1 structural intervention

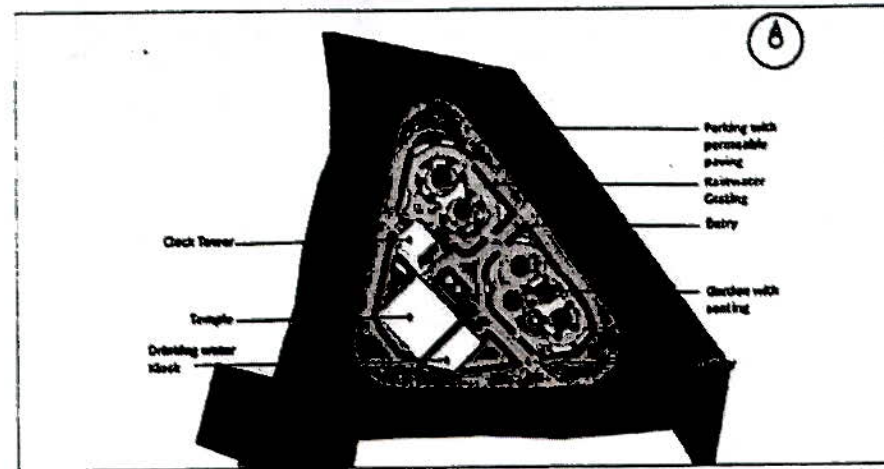
Structural intervention of the project includes making of Kalyani as social space by

6.1.1 Restructuring the Kalyani and its edges with stone work

Two entrances to the project provided from the Kondaji road from eastern side and southern side. Main entrance to the site is from the eastern side with colonnaded structure around the Kalyani is provided. With seating space and landscaped elements. A separate entrance is also provided from the proposed garden/park side along with proposed amenities block of Durgambika temple trust. Pedestrian pathways along the east and south direction of the site is enhancing the accessibility of the communities and informal activities as part of cultural and social inclusion.



Proposed image of the clock tower precinct. Source: DPR Davanagere



Proposed plan of the clock tower precinct. Source: DPR Davanagere