

# Changing Forest Scenario of Gujarat- A review

N.K.Bohra

Arid Forest Research Institute, Jodhpur (Rajasthan)

**Abstract-** Gujarat has border with Pakistan in the northwest whereas it is bounded by the Arabian Sea to the south east and in northwest it joined Rajasthan state. In the east it has boundary with Madhya Pradesh and in south with Maharashtra, Union Territory of Dadar Nagar Haveli and Daman and Diu. It has Narmada river, the longest river followed by the Tapi, Sabarmati etc. Gujarat is also known for Rann of Kutch, a seasonally marshy saline clay desert. Gujarat is divided into 7 agro climatic zones Southern hills (Dang and Valsad), Southern Gujarat, Middle Gujarat, North Gujarat, North west arid, North Saurashtra and South Saurashtra. Rainfall varies in different parts of state and thus the vegetation also differ in different parts of Gujarat. Arid zone to high rainfall and mangrove vegetation in marshy land were exists. During the past decades forest cover changes in different parts of state. A detailed change in vegetation is described in the paper.

**Keyword-** VDF, MDF, Scrub forest, Rann of Kutch

## **INTRODUCTION:**

Gujarat is situated between latitude 20° 07' N to 24° 43' N and longitude 68° 10' E to 74° 29' E. As per 2011 census was 60.44 million in which 25.74 million (42.60 percent) is urban, 34.70 million (57.40 percent) is rural and 8.92 million (14.75 percent) tribal population. Its geographical area is 196244 square km. Gujarat has an average population density 308 per square kilometer. Gujarat has 26 districts out of which 9 are tribal districts. As per 19th livestock population was 2712 million. Its forest area is 37,23,000 hectare (19.52 percent of geographical area). It's faster and other grazing land is 8,51,000 (4.46 percent). Its net area sown is 10302000 ha 54.02% source land use statistics, Ministry of Agriculture Government of India 2017 to 18.

## **Changes in forest cover from 2003 to 2021 in different districts change in various forest types are as follows:**

**1. Ahmedabad-** Its geographical area was 8107 km<sup>2</sup> which has changed to 28170 km<sup>2</sup> after resettlement of districts. There is no very dense forest. Moderate dense forest in 2003 was 28 km square, 22 km<sup>2</sup> in 2005, 14 km<sup>2</sup> in 2009, 15 km<sup>2</sup> in 2011, 14 km<sup>2</sup> in 2013 and 2015, 12 km<sup>2</sup> in 2017, 13 km<sup>2</sup> in 2019 and 11 km<sup>2</sup> in 2021. Open forest area was 149 km<sup>2</sup> in 2003, 122 km<sup>2</sup> in 2005, 128 km<sup>2</sup> in 2009, 130 km<sup>2</sup> in 2011, 137 km<sup>2</sup> in 2013, 135 km<sup>2</sup> in 2015, 117 km<sup>2</sup> in 2017, 118 km<sup>2</sup> in 2019 and 103 km<sup>2</sup> in 2021.

Total forest area of Ahmedabad was 117 km<sup>2</sup> in 2003, 144 km<sup>2</sup> in 2005, 143 km<sup>2</sup> in 2009, 144 km<sup>2</sup> in 2011, 151 km<sup>2</sup> in 2013, 149 km<sup>2</sup> in 2015, 129 km<sup>2</sup> in 2017, 131 km<sup>2</sup> in 2019 and 114 km<sup>2</sup> in 2021. Scrub forest area was 16 km<sup>2</sup> in 2005, 17 km<sup>2</sup> in 2009, 14 km<sup>2</sup> in 2011 to 2015, 52 km<sup>2</sup> in 2017, 41 km<sup>2</sup> in 2019 and 31 km<sup>2</sup> in 2021.

**2. Amreli-** Its geographical area was 6760 km<sup>2</sup> but after the resettlement it became 7397 km<sup>2</sup>. Very dense forest is altogether absent. Moderate dense forest area was 65 km<sup>2</sup> in 2003, 60 km<sup>2</sup> in 2005, 63 km<sup>2</sup> from 2009 to 2019 and 65 km<sup>2</sup> in 2021. Open forest area was 153 km<sup>2</sup> in 2013, 158 km<sup>2</sup> in 2005, 167 km<sup>2</sup> in 2009 and 2011, 168 km<sup>2</sup> in 2013 and 2015, 188 km<sup>2</sup> in 2017, 197 km<sup>2</sup> in 2019 and 200 km<sup>2</sup> in 2021.

Total forest area was 218 km<sup>2</sup> in 2003. 224 km<sup>2</sup> in 2005, 230 km<sup>2</sup> in 2009 and 2011, 231 km<sup>2</sup> in 2013 and 2015, 251 km<sup>2</sup> in 2017, 260 km<sup>2</sup> in 2019 and 265 km<sup>2</sup> in 2021. Scrub forest area was 41 km<sup>2</sup> in 2005, 36 km<sup>2</sup> in 2009 and 2011, 37 km<sup>2</sup> in 2013 and 2015, 66 km<sup>2</sup> in 2017, 91 km<sup>2</sup> in 2019 and 90 km<sup>2</sup> in 2021.

**3. Anand-** Its geographical area was 3214 km<sup>2</sup> but after the resettlement it became 3204 km<sup>2</sup>. Very dense forest is altogether absent. Moderate dense forest area was 26 km<sup>2</sup> in 2003, 24 km<sup>2</sup> in 2005, 18 km<sup>2</sup> in 2009, 19 km<sup>2</sup> in 2011, 18 km<sup>2</sup> from 2013 to 2017, 9 km<sup>2</sup> in 2019 and 6 km<sup>2</sup> in 2021. Open forest area was 34 km<sup>2</sup> in 2003, 35 km<sup>2</sup> in 2005, 36 km<sup>2</sup> in 2009, 34 km<sup>2</sup> in 2011, 42 km<sup>2</sup> from 2013 to 2015 and 45 km<sup>2</sup> in 2017, 41 km<sup>2</sup> in 2019 and 28 km<sup>2</sup> in 2021.

Total forest area was 60 km<sup>2</sup> in 2003, 59 km<sup>2</sup> in 2005, 52 km<sup>2</sup> in 2011, 60 km<sup>2</sup> in 2013 and 2015, 63 km<sup>2</sup> in 2017, 50 km<sup>2</sup> in 2019 and 34 km<sup>2</sup> in 2021.

Scrub forest area was 4 km<sup>2</sup> in 2005 and 2009, 5 km<sup>2</sup> from 2011 to 2015, 19 km<sup>2</sup> in 2017, 17 km<sup>2</sup> in 2019 and 14 km<sup>2</sup> in 2021.

**4. Banas kantha-** Its geographical area was 10,099 km<sup>2</sup> but after the resettlement it became 10,743 km<sup>2</sup>. Very dense forest is altogether absent. Moderate dense forest area was 429 km<sup>2</sup> in 2003, 370 km<sup>2</sup> in 2005, 369 km<sup>2</sup> in 2009, 371 km<sup>2</sup> in 2011, 361 km<sup>2</sup> from 2013 and 2015, 272 km<sup>2</sup> in 2017, 368 km<sup>2</sup> in 2019 and 355 km<sup>2</sup> in 2021. Open forest area was 432 km<sup>2</sup> in 2003, 463 km<sup>2</sup> in 2005, 473 km<sup>2</sup> in 2009, 472 km<sup>2</sup> in 2011, 471 km<sup>2</sup> from 2013, 472 km<sup>2</sup> in 2015, 476 km<sup>2</sup> in 2017, 455 km<sup>2</sup> in 2019 and 462 km<sup>2</sup> in 2021.

Total forest area is 861 km<sup>2</sup> in 2003, 833 km<sup>2</sup> in 2005, 844 km<sup>2</sup> in 2009, 842 km<sup>2</sup> in 2011, 840 km<sup>2</sup> in 2013, 841 km<sup>2</sup> in 2015, 848 km<sup>2</sup> in 2017 and 822 km<sup>2</sup> in 2019 and 817 km<sup>2</sup> in 2021. Scrub forest area was 189 km<sup>2</sup> in 2005, 184 km<sup>2</sup> in 2009, 186 km<sup>2</sup> from 2011 to 2015, 208 km<sup>2</sup> in 2017, 154 km<sup>2</sup> in 2019 and 117 km<sup>2</sup> in 2021.

**5. Bharuch-** Its geographical area was 6458 km<sup>2</sup> but after the resettlement it became 6509 km<sup>2</sup>. Very dense forest was altogether absent. Moderate dense forest area was 91 km<sup>2</sup> in 2003, 89 km<sup>2</sup> in 2005, 76 km<sup>2</sup> in 2009, 85 km<sup>2</sup> in 2011, 76 km<sup>2</sup> from 2013, 75 km<sup>2</sup> in 2015, 71 km<sup>2</sup> in 2017 and 58 km<sup>2</sup> in 2019 and 56 km<sup>2</sup> in 2021. Open forest area was 249 km<sup>2</sup> in 2003, 240 km<sup>2</sup> in 2005, 234 km<sup>2</sup> in 2009, 227 km<sup>2</sup> in 2011, 234 km<sup>2</sup> from 2013, 235 km<sup>2</sup> in 2015, 243 km<sup>2</sup> in 2017, 219 km<sup>2</sup> in 2019 and 217 km<sup>2</sup> in 2021.

Total forest area was 340 km<sup>2</sup> in 2003, 329 km<sup>2</sup> in 2005, 319 km<sup>2</sup> in 2009, 308 km<sup>2</sup> in 2011, 310 km<sup>2</sup> in 2013 and 2015, 314 km<sup>2</sup> in 2017, 278 km<sup>2</sup> in 2019 and 273 km<sup>2</sup> in 2021. Scrub forest area was 7 km<sup>2</sup> in 2005, 3 km<sup>2</sup> in 2009, 5 km<sup>2</sup> from 2011 to 2015, 26 km<sup>2</sup> in 2017, 14 km<sup>2</sup> in 2019 and 7 km<sup>2</sup> in 2021.

**6. Bhavnagar-** Its geographical area was 1, 1,155 km<sup>2</sup> but after the resettlement it became 10,034 km<sup>2</sup>. Very dense forest is altogether absent. Moderate dense forest area was 82 km<sup>2</sup> in 2003, 63 km<sup>2</sup> in 2005, 52 km<sup>2</sup> in 2009, 54 km<sup>2</sup> in 2011, 52 km<sup>2</sup> from 2013 and 2015, 47 km<sup>2</sup> in 2017, 48 km<sup>2</sup> in 2019 and 47 km<sup>2</sup> in 2021. Open forest area in Bhavnagar was 238 km<sup>2</sup> in 2003, 223 km<sup>2</sup> in 2005, 226 km<sup>2</sup> in 2009, 235 km<sup>2</sup> in 2011, 227 km<sup>2</sup> from 2013, 233 km<sup>2</sup> in 2015, 230 km<sup>2</sup> in 2017, 245 km<sup>2</sup> in 2019 and 2021.

Total forest area was 320 km<sup>2</sup> in 2003, 286 km<sup>2</sup> in 2005, 280 km<sup>2</sup> in 2009, 287 km km<sup>2</sup> in 2011, 279 km<sup>2</sup> in 2013, 285 km<sup>2</sup> in 2015, 277 km<sup>2</sup> in 2017, 293 km<sup>2</sup> in 2019 and 2021. Scrub forest area was 75 km<sup>2</sup> in 2005 & 2009, 79 km<sup>2</sup> in 2011, 75 km<sup>2</sup> in 2013 & 2015, 76 km<sup>2</sup> in 2017, 85 km<sup>2</sup> in 2019 and 79 km<sup>2</sup> in 2021.

**7. Dahod-** Its geographical area was 4405 km<sup>2</sup> which reduce to 3642 km<sup>2</sup> after resettlement of districts. Very dense forest is altogether nil in 2003 & 2005 but from 2009 to 2021 it was 1 km<sup>2</sup>. Moderate dense forest area was 182 km<sup>2</sup> in 2003, 181 km<sup>2</sup> in 2005, 163 km<sup>2</sup> in 2009 to 2015, 118 km<sup>2</sup> in 2017, 116 km<sup>2</sup> in 2019 and 115 km<sup>2</sup> in 2021. Open forest area was 524 km<sup>2</sup> in 2003, 525 km<sup>2</sup> in 2005, 538 km<sup>2</sup> in 2009, 540 km<sup>2</sup> in 2011, 538 km<sup>2</sup> from 2013 & 2015, 419 km<sup>2</sup> in 2017, 413 km<sup>2</sup> in 2019 and 406 km<sup>2</sup> in 2021.

Total forest area was 706 km<sup>2</sup> in 2003 & 2005, 702 km<sup>2</sup> in 2009, 704 km km<sup>2</sup> in 2011, 702 km<sup>2</sup> in 2013 & 2015, 538 km<sup>2</sup> in 2017, 530 km<sup>2</sup> in 2019 and 522 km<sup>2</sup> in 2021.

Scrub forest area was 40 km<sup>2</sup> in 2005, 35 km<sup>2</sup> in 2009, 36 km<sup>2</sup> from 2011 to 2015, 45 km<sup>2</sup> in 2017 and 30 km<sup>2</sup> in 2019 and 29 km<sup>2</sup> in 2021.

**8. Gandhinagar-** Its geographical area was 449 km<sup>2</sup> which becomes 2140 km<sup>2</sup> after resettlement of districts. Very dense forest was absent altogether. Moderate dense forest area was 9 km<sup>2</sup> in 2003 & 2005, 6 km<sup>2</sup> from 2009 to 2015, 11 km<sup>2</sup> in 2017 and 10 km<sup>2</sup> in 2019 and 9 km<sup>2</sup> in 2021. Open forest area was 35 km<sup>2</sup> in 2003, 33 km<sup>2</sup> in 2005, 36 km<sup>2</sup> in 2009 & 2011, 35 km<sup>2</sup> in 2013 & 2015, 81 km<sup>2</sup> in 2017 and 82 km<sup>2</sup> in 2019 and 91 km<sup>2</sup> in 2021.

Total forest area was 44 km<sup>2</sup> in 2003, 42 km<sup>2</sup> in 2005, 2009 & 2011, 41 km<sup>2</sup> in 2013 & 2015, 92 km<sup>2</sup> in 2017 & 2019 and 100 km<sup>2</sup> in 2021. Scrub forest area was 2 km<sup>2</sup> from 2005 to 2015, 50 km<sup>2</sup> in 2017 and 52 km<sup>2</sup> in 2019 and 38 km<sup>2</sup> in 2021.

**9. Jamnagar-** Its geographical area was 14125 km<sup>2</sup> which becomes 14184 km<sup>2</sup> after resettlement of district boundaries. Very dense forest was altogether absent. Moderate dense forest area was 59 km<sup>2</sup> in 2003, 57 km<sup>2</sup> in 2005, 53 km<sup>2</sup> in 2009, 54 km<sup>2</sup> in 2011, 53 km<sup>2</sup> in 2013 & 2015, 55 km<sup>2</sup> in 2017 and 54 km<sup>2</sup> in 2019 and 2021. Open dense forest area was 210 km<sup>2</sup> in 2003, 324 km<sup>2</sup> in 2005, 360 km<sup>2</sup> in 2009, 358 km<sup>2</sup> in 2011, 364 km<sup>2</sup> in 2013, 369 km<sup>2</sup> in 2015, 380 km<sup>2</sup> in 2017, 417 km<sup>2</sup> in 2019 and 424 km<sup>2</sup> in 2021.

Total forest area was 369 km<sup>2</sup> in 2003, 381 km<sup>2</sup> in 2005, 414 km<sup>2</sup> in 2009, 412 km<sup>2</sup> in 2011, 417 km<sup>2</sup> in 2013, 422 km<sup>2</sup> in 2015, 435 km<sup>2</sup> in 2017, 471 km<sup>2</sup> in 2019 and 477 km<sup>2</sup> in 2021. Scrub forest area was 72 km<sup>2</sup> from 2005, 64 km<sup>2</sup> in 2009, 66 km<sup>2</sup> in 2011, 65 km<sup>2</sup> in 2013 & 2015, 99 km<sup>2</sup> in 2017 and 158 km<sup>2</sup> in 2019 and 159 km<sup>2</sup> in 2021.

**10. Junagadh-** Its geographical area was 8281 km<sup>2</sup> which becomes 8831 km<sup>2</sup> after resettlement of district boundaries. Very dense forest was 9 km<sup>2</sup> in 2003 & 2005, 15 km<sup>2</sup> from 2009 to 2021. Moderate dense forest area was 926 km<sup>2</sup> in 2003, 920 km<sup>2</sup> in 2005, 952 km<sup>2</sup> from 2009 to 2015, 956 km<sup>2</sup> in 2017, 938 km<sup>2</sup> in 2019 and 2021. Open forest area was 673 km<sup>2</sup> in 2003, 672 km<sup>2</sup> in 2005, 633 km<sup>2</sup> in 2009, 641 km<sup>2</sup> in 2011 & 2013, 640 km<sup>2</sup> in 2015, 1634 km<sup>2</sup> in 2017, 740 km<sup>2</sup> in 2019 and 786 km<sup>2</sup> in 2021.

Total forest area was 1608 km<sup>2</sup> in 2003, 1601 km<sup>2</sup> in 2005, 1600 km<sup>2</sup> in 2009, 1608 km<sup>2</sup> in 2011 & 2013, 1607 km<sup>2</sup> in 2015, 1634 km<sup>2</sup> in 2017, 1693 km<sup>2</sup> in 2019 and 1739 km<sup>2</sup> in 2021.

Scrub forest area was 34 km<sup>2</sup> from 2005, 24 km<sup>2</sup> in 2009, 23 km<sup>2</sup> in 2011, 24 km<sup>2</sup> in 2013 & 2015, 60 km<sup>2</sup> in 2017, 95 km<sup>2</sup> in 2019 and 86 km<sup>2</sup> in 2021.

**11. Kachchh-** Its geographical area was 45652 km<sup>2</sup> which change to 45674 km<sup>2</sup> after resettlement of district boundaries. There is no very dense forest area. Moderate dense forest area was 408 km<sup>2</sup> in 2003, 400 km<sup>2</sup> in 2005, 301 km<sup>2</sup> from 2009, 312 km<sup>2</sup> in 2011, 301 km<sup>2</sup> in 2013 & 2017, 285 km<sup>2</sup> in 2019 and 283 km<sup>2</sup> in 2021. Open forest area was 1875 km<sup>2</sup> in 2003, 1839 km<sup>2</sup> in 2005, 1999 km<sup>2</sup> in 2009, 1995 km<sup>2</sup> in 2011, 2011 km<sup>2</sup> in 2013, 2005 km<sup>2</sup> in 2015, 2011 km<sup>2</sup> in 2017, 2060 km<sup>2</sup> in 2019 and 2157 km<sup>2</sup> in 2021.

Total forest area was 2283 km<sup>2</sup> in 2003, 2239 km<sup>2</sup> in 2005, 2311 km<sup>2</sup> in 2009, 2299 km<sup>2</sup> in 2011, 2312 km<sup>2</sup> in 2013, 2306 km<sup>2</sup> in 2015, 2312 km<sup>2</sup> in 2017, 2345 km<sup>2</sup> in 2019 and 2439 km<sup>2</sup> in 2021. Scrub forest area was 521 km<sup>2</sup> from 2005, 571 km<sup>2</sup> in 2009, 564 km<sup>2</sup> in 2011, 576 km<sup>2</sup> in 2013 & 2015, 752 km<sup>2</sup> in 2017, 1520 km<sup>2</sup> in 2019 and 1506 km<sup>2</sup> in 2021.

**12. Kheda-** Its geographical area was 3980 km<sup>2</sup> which change 3953 km<sup>2</sup> after resettlement of district. Very dense forest was altogether absent. Moderate dense forest area was 28 km<sup>2</sup> in 2003, 25 km<sup>2</sup> in 2005, 20 km<sup>2</sup> from 2009, 21 km<sup>2</sup> in 2011, 20 km<sup>2</sup> from 2013 to 2017, 18 km<sup>2</sup> in 2019 and 15 km<sup>2</sup> in 2021.

Open forest area was 74 km<sup>2</sup> in 2003, 73 km<sup>2</sup> in 2005, 74 km<sup>2</sup> in 2009 to 2013, 75 km<sup>2</sup> in 2015, 79 km<sup>2</sup> in 2017, 77 km<sup>2</sup> in 2019 and 73 km<sup>2</sup> in 2021.

Total forest area of Kheda 102 km<sup>2</sup> in 2003, 98 km<sup>2</sup> in 2005, 95 km<sup>2</sup> in 2009, 94 km<sup>2</sup> in 2011 & 2013, 95 km<sup>2</sup> in 2015, 94 km<sup>2</sup> in 2017 & 2019 and 88 km<sup>2</sup> in 2021. Scrub forest area was 19 km<sup>2</sup> from 2005, 16 km<sup>2</sup> from 2009 to 2013, 15 km<sup>2</sup> in 2015, 37 km<sup>2</sup> in 2017, 36 km<sup>2</sup> in 2019 and 32 km<sup>2</sup> in 2021.

**13. Mehsana-** Its geographical area was 8299 km<sup>2</sup> which reduce to 4401 km<sup>2</sup> after resettlement of district area. It has no area under very dense forest. Moderate dense forest area was 24 km<sup>2</sup> in 2003, 25 km<sup>2</sup> in 2005, 19 km<sup>2</sup> from 2009 to 2015, 13 km<sup>2</sup> in 2017, 10 km<sup>2</sup> in 2019 and 11 km<sup>2</sup> in 2021. Open forest area was 213 km<sup>2</sup> in 2003, 195 km<sup>2</sup> in 2005, 196 km<sup>2</sup> in 2009, 195 km<sup>2</sup> from 2011 to 2015, 146 km<sup>2</sup> in 2017, 149 km<sup>2</sup> in 2019 and 154 km<sup>2</sup> in 2021.

Total forest area of 237 km<sup>2</sup> in 2003, 220 km<sup>2</sup> in 2005, 215 km<sup>2</sup> in 2009, 214 km<sup>2</sup> in 2011 to 2015, 159 km<sup>2</sup> in 2017 & 2019 and 164 km<sup>2</sup> in 2021. Scrub forest area was 54 km<sup>2</sup> from 2005, 51 km<sup>2</sup> from 2009, 50 km<sup>2</sup> in 2011, 49 km<sup>2</sup> in 2013 & 2015, 64 km<sup>2</sup> in 2017 and 46 km<sup>2</sup> in 2019 and 30 km<sup>2</sup> in 2021.

**14. Narmada-** Its geographical area was 2580 km<sup>2</sup> which becomes 2817 km<sup>2</sup> after resettlement of district area. Very dense forest area was nil during 2003 & 2005 while 20 km<sup>2</sup> from 2009 to 2021. Moderate dense forest area was 507 km<sup>2</sup> in 2003, 506 km<sup>2</sup> in 2005, 465 km<sup>2</sup> from 2009 to 2015, 464 km<sup>2</sup> in 2017, 460 km<sup>2</sup> in 2019 and 443 km<sup>2</sup> in 2021. Open forest area was 498 km<sup>2</sup> in 2003, 494 km<sup>2</sup> in 2005, 474 km<sup>2</sup> from 2009 to 2015, 479 km<sup>2</sup> in 2017 and 468 km<sup>2</sup> in 2019 and 464 km<sup>2</sup> in 2021.

Total forest area of Narmada was 1005 km<sup>2</sup> in 2003, 1000 km<sup>2</sup> in 2005, 959 km<sup>2</sup> from 2009 to 2015, 963 km<sup>2</sup> in 2017 and 948 km<sup>2</sup> in 2019 and 927 km<sup>2</sup> in 2021. Scrub forest area was 22 km<sup>2</sup> from 2005, 19 km<sup>2</sup> from 2009, 21 km<sup>2</sup> in 2011 to 2015, 32 km<sup>2</sup> in 2017 and 25 km<sup>2</sup> in 2019 and 23 km<sup>2</sup> in 2021.

**15. Navsari-** Its geographical area was 2215 km<sup>2</sup> which becomes 2246 km<sup>2</sup> after resettlement of district boundaries. Very dense forest area was nil during 2003 & 2005 while 18 km<sup>2</sup> from 2009 to 2015, 10 km<sup>2</sup> in 2017 and 18 km<sup>2</sup> in 2019 & 2021. Moderate dense forest area was 191 km<sup>2</sup> in 2003, 166 km<sup>2</sup> in 2005, 125 km<sup>2</sup> from 2009 to 2017 and 122 km<sup>2</sup> in 2019 & 2021.

Open forest area was 123 km<sup>2</sup> in 2003, 141 km<sup>2</sup> in 2005, 147 km<sup>2</sup> from 2009, 145 km<sup>2</sup> in 2011, 147 km<sup>2</sup> in 2013 & 2015, 159 km<sup>2</sup> in 2017 and 222 km<sup>2</sup> in 2019 & 2021.

Total forest area of was 314 km<sup>2</sup> in 2003, 307 km<sup>2</sup> in 2005, 250 km<sup>2</sup> from 2009, 288 km<sup>2</sup> in 2011, 290 km<sup>2</sup> in 2013 & 2015, 302 km<sup>2</sup> in 2017 and 362 km<sup>2</sup> in 2019 & 2021.

Scrub forest area was 1 km<sup>2</sup> from 2005, 6 km<sup>2</sup> from 2009, 8 km<sup>2</sup> in 2011 to 2015, 15 km<sup>2</sup> in 2017, 10 km<sup>2</sup> in 2019 and 7 km<sup>2</sup> in 2021.

**16. Panch Mahal-** Its geographical area was 4461 km<sup>2</sup> which increases to 5231 km<sup>2</sup> after resettlement of district boundaries. Very dense forest was absent altogether. Moderate dense forest area was 183 km<sup>2</sup> in 2003, 180 km<sup>2</sup> in 2005, 178 km<sup>2</sup> from 2009, 176 km<sup>2</sup> in 2011, 178 km<sup>2</sup> in 2013, 179 km<sup>2</sup> in 2015, 219 km<sup>2</sup> in 2017, 203 km<sup>2</sup> in 2019 and 202 km<sup>2</sup> in 2021.

Open forest area was 393 km<sup>2</sup> in 2003, 385 km<sup>2</sup> in 2005, 394 km<sup>2</sup> from 2009 & 2011, 393 km<sup>2</sup> in 2013, 392 km<sup>2</sup> in 2015, 518 km<sup>2</sup> in 2017, 507 km<sup>2</sup> in 2019 and 531 km<sup>2</sup> in 2021. Total forest area of Panch Mahal was 576 km<sup>2</sup> in 2003, 565 km<sup>2</sup> in 2005, 570 km<sup>2</sup> in 2009 & 2011, 571 km<sup>2</sup> in 2013 & 2015, 737 km<sup>2</sup> in 2017, 710 km<sup>2</sup> in 2019 and 733 km<sup>2</sup> in 2021. Scrub forest area was 41 km<sup>2</sup> from 2005, 35 km<sup>2</sup> from 2009 & 2011, 36 km<sup>2</sup> in 2013 & 2015, 37 km<sup>2</sup> in 2017 and 49 km<sup>2</sup> in 2019 and 51 km<sup>2</sup> in 2021.

**17. Patan-** Its geographical area was 3332 km<sup>2</sup> which increases to 5792 km<sup>2</sup> after resettlement of district boundaries. Very dense forest was absent altogether. Moderate dense forest area was 10 km<sup>2</sup> in 2003, 8 km<sup>2</sup> in 2005, 4 km<sup>2</sup> from 2009 to 2015, 1 km<sup>2</sup> in 2017, 2019 and 2021. Open forest area was 89 km<sup>2</sup> in 2003, 78 km<sup>2</sup> in 2005, 79 km<sup>2</sup> from 2009 & 2011, 81 km<sup>2</sup> in 2013 & 2015, 101 km<sup>2</sup> in 2017, 2019 and 97 km<sup>2</sup> in 2021.

Total forest area was 99 km<sup>2</sup> in 2003, 86 km<sup>2</sup> in 2005, 83 km<sup>2</sup> in 2009 & 2011, 85 km<sup>2</sup> in 2013 & 2015, 102 km<sup>2</sup> in 2017, 103 km<sup>2</sup> in 2019 and 98 km<sup>2</sup> in 2021. Scrub forest area was 28 km<sup>2</sup> from 2005, 24 km<sup>2</sup> from 2009 & 2011, 25 km<sup>2</sup> in 2013 & 2015, 126 km<sup>2</sup> in 2017, 116 km<sup>2</sup> in 2019 and 93 km<sup>2</sup> in 2021.

**18. Porbander-** Its geographical area was 2326 km<sup>2</sup> which reduces to 2316 km<sup>2</sup> after resettlement of district boundaries. Very dense forest was altogether absent. Moderate dense forest area was 22 km<sup>2</sup> in 2003 & 2005, 16 km<sup>2</sup> from 2009 to 2021. Open forest area of Porbander was 92 km<sup>2</sup> in 2003, 96 km<sup>2</sup> in 2005, 104 km<sup>2</sup> from 2009, 107 km<sup>2</sup> in 2011, 108 km<sup>2</sup> from 2013 & 2017, 111 km<sup>2</sup> in 2019 and 110 km<sup>2</sup> in 2021.

Total forest area was 114 km<sup>2</sup> in 2003, 118 km<sup>2</sup> in 2005, 120 km<sup>2</sup> in 2009, 123 km<sup>2</sup> in 2011, 124 km<sup>2</sup> from 2013 to 2017 and 127 km<sup>2</sup> in 2019 and 126 km<sup>2</sup> in 2021. Scrub forest area was 18 km<sup>2</sup> from 2005, 16 km<sup>2</sup> from 2009 to 2015, 20 km<sup>2</sup> in 2017, 40 km<sup>2</sup> in 2019 and 41 km<sup>2</sup> in 2021.

**19. Rajkot-** Its geographical area was 11203 km<sup>2</sup> which reduces to 11198 km<sup>2</sup> after resettlement of district boundaries. Very dense forest was altogether absent. Moderate dense forest area was 9 km<sup>2</sup> in 2003, 8 km<sup>2</sup> in 2005, 4 km<sup>2</sup> from 2009 to 2015, and 3 km<sup>2</sup> in 2017, 2019 & 2021. Open forest area of was 139 km<sup>2</sup> in 2003 & 2005, 137 km<sup>2</sup> from 2009 & 2011, 138 km<sup>2</sup> from 2013 & 2017, 152 km<sup>2</sup> in 2019 and 154 km<sup>2</sup> in 2021.

Total forest area was 148 km<sup>2</sup> in 2003, 147 km<sup>2</sup> in 2005, 141 km<sup>2</sup> in 2009 & 2011, 142 km<sup>2</sup> from 2013 & 2015, 141 km<sup>2</sup> in 2017, 154 km<sup>2</sup> in 2019 and 156 km<sup>2</sup> in 2021. Scrub forest area was 31 km<sup>2</sup> from 2005, 29 km<sup>2</sup> from 2009, 34 km<sup>2</sup> in 2011, 33 km<sup>2</sup> from 2013 & 2015, 90 km<sup>2</sup> in 2017, 82 km<sup>2</sup> in 2019 and 99 km<sup>2</sup> in 2021.

**20. Sabarkantha-** Its geographical area was 7390 km<sup>2</sup> which increases to 7394 km<sup>2</sup> after resettlement of district. Very dense forest was zero in 2003 & 2005, 29 km<sup>2</sup> in 2009 to 2021. Moderate dense forest area was 323 km<sup>2</sup> in 2003, 343 km<sup>2</sup> in 2005, 304 km<sup>2</sup> in 2009, 305 km<sup>2</sup> in 2011, 304 km<sup>2</sup> from 2013 & 2017, 302 km<sup>2</sup> in 2019 and 299 km<sup>2</sup> in 2021. Open forest area of was 476 km<sup>2</sup> in 2003, 458 km<sup>2</sup> 2005, 488 km<sup>2</sup> in 2009, 470 km<sup>2</sup> in 2011, 472 km<sup>2</sup> from 2013 & 2015, 474 km<sup>2</sup> in 2017 and 484 km<sup>2</sup> in 2019 & 2021.

Total forest area was 799 km<sup>2</sup> in 2003, 801 km<sup>2</sup> in 2005, 802 km<sup>2</sup> in 2009, 804 km<sup>2</sup> in 2011, 805 km<sup>2</sup> from 2013 & 2015, 807 km<sup>2</sup> in 2017, 805 km<sup>2</sup> in 2019 and 812 km<sup>2</sup> in 2021. Scrub forest area was 110 km<sup>2</sup> from 2005, 90 km<sup>2</sup> from 2009, 91 km<sup>2</sup> in 2011 & 2015, 130 km<sup>2</sup> in 2017, 112 km<sup>2</sup> in 2019 and 102 km<sup>2</sup> in 2021.

**21. Surat-** Its geographical area was 7657 km<sup>2</sup> which reduces to 4549 km<sup>2</sup> after resettlement of district. Very dense forest was 27 km<sup>2</sup> in 2003 & 2005, 84 km<sup>2</sup> from 2009 to 2015, 5 km<sup>2</sup> from 2017 to 2021. Moderate dense forest area was 856 km<sup>2</sup> in 2003, 845 km<sup>2</sup> in 2005, 776 km<sup>2</sup> in 2009, 778 km<sup>2</sup> in 2011, 776 km<sup>2</sup> from 2013 & 2015, 294 km<sup>2</sup> in 2017, 289 km<sup>2</sup> in 2019 and 285 km<sup>2</sup> in 2021. Open forest area of was 471 km<sup>2</sup> in 2003, 467 km<sup>2</sup> 2005, 445 km<sup>2</sup> in 2009, 454 km<sup>2</sup> in 2011, 455 km<sup>2</sup> from 2013, 456 km<sup>2</sup> in 2015, 216 km<sup>2</sup> in 2017, 206 km<sup>2</sup> in 2019 and 209 km<sup>2</sup> in 2021.

Total forest area was 1354 km<sup>2</sup> in 2003, 1339 km<sup>2</sup> in 2005, 1307 km<sup>2</sup> in 2009, 1316 km<sup>2</sup> in 2011, 1315 km<sup>2</sup> from 2013, 1316 km<sup>2</sup> in 2015, 515 km<sup>2</sup> in 2017, 500 km<sup>2</sup> in 2019 and 499 km<sup>2</sup> in 2021. Scrub forest area was 24 km<sup>2</sup> from 2005, 26 km<sup>2</sup> from 2009, 32 km<sup>2</sup> in 2011, 33 km<sup>2</sup> in 2013 & 2015, 90 km<sup>2</sup> in 2017, 82 km<sup>2</sup> in 2019 and 78 km<sup>2</sup> in 2021.

**22. Surendranagar-** Its geographical area was 10489 km<sup>2</sup> which reduces to 10423 km<sup>2</sup> after resettlement of district. Very dense forest was altogether absent. Moderate dense forest area was 13 km<sup>2</sup> in 2003, 12 km<sup>2</sup> in 2005, 8 km<sup>2</sup> in 2009 to 2015, 6 km<sup>2</sup> in 2017, 2019 & 2021. Open forest area of was 159 km<sup>2</sup> in 2003, 160 km<sup>2</sup> 2005, 165 km<sup>2</sup> in 2009, 160 km<sup>2</sup> in 2015, 169 km<sup>2</sup> in 2017, 168 km<sup>2</sup> in 2019 and 157 km<sup>2</sup> in 2021.

Total forest area was 172 km<sup>2</sup> in 2003 & 2005, 173 km<sup>2</sup> in 2009, 173 km<sup>2</sup> in 2011 to 2013, 176 km<sup>2</sup> in 2015, 175 km<sup>2</sup> in 2017, 174 km<sup>2</sup> in 2019 and 163 km<sup>2</sup> in 2021. Scrub forest area was 111 km<sup>2</sup> in 2009, 92 km<sup>2</sup> in 2015, 26 km<sup>2</sup> in 2017 and 48 km<sup>2</sup> in 2019 & 2021.

**23. The Dangs-** Its geographical area was 1762 km<sup>2</sup> which reduces to 1766 km<sup>2</sup> after resettlement of district boundaries. Very dense forest was 78 km<sup>2</sup> in 2003 & 2005, 209 km<sup>2</sup> from 2009 to 2015, 210 km<sup>2</sup> in 2017, 2019 & 2021. Moderate dense forest area was 1013 km<sup>2</sup> in 2003, 995 km<sup>2</sup> in 2005, 745 km<sup>2</sup> in 2009 to 2015, 743 km<sup>2</sup> in 2017, 741 km<sup>2</sup> in 2019 and 740 km<sup>2</sup> in 2021. Open forest area of was 326 km<sup>2</sup> in 2003, 339 km<sup>2</sup> 2005, 414 km<sup>2</sup> from 2009 to 2015, 415 km<sup>2</sup> in 2017, 412 km<sup>2</sup> in 2019 and 404 km<sup>2</sup> in 2021. Total forest area was 1417 km<sup>2</sup> in 2003, 1412 km<sup>2</sup> in 2005, 1368 km<sup>2</sup> from 2009 to 2017, 1363 km<sup>2</sup> in 2019 and 1354 km<sup>2</sup> in 2021. Scrub forest area was nil in 2005, 3 km<sup>2</sup> in 2009 to 2015, 2 km<sup>2</sup> in 2017 and 3 km<sup>2</sup> in 2019 & 2021.

**24. Vadodara-** Its geographical area was 7794 km<sup>2</sup> which reduces to 7546 km<sup>2</sup> after resettlement of district boundaries. Very dense forest was altogether absent. Moderate dense forest area was 163 km<sup>2</sup> in 2003, 161 km<sup>2</sup> in 2005, 144 km<sup>2</sup> in 2009 to 2015, 145 km<sup>2</sup> in 2017, 141 km<sup>2</sup> in 2019 and 140 km<sup>2</sup> in 2021. Open forest area of was 465 km<sup>2</sup> in 2003, 460 km<sup>2</sup> 2005, 479 km<sup>2</sup> from 2009 & 2011, 482 km<sup>2</sup> in 2013, 484 km<sup>2</sup> in 2015 & 2017, 462 km<sup>2</sup> in 2019 and 453 km<sup>2</sup> in 2021.

Total forest area was 628 km<sup>2</sup> in 2003, 621 km<sup>2</sup> in 2005, 623 km<sup>2</sup> from 2009 & 2011, 626 km<sup>2</sup> in 2013, 628 km<sup>2</sup> in 2015, 629 km<sup>2</sup> in 2017, 603 km<sup>2</sup> in 2019 and 592 km<sup>2</sup> in 2021. Scrub forest area was 33 km<sup>2</sup> in 2005, 27 km<sup>2</sup> in 2009 to 2015, 60 km<sup>2</sup> in 2017, 43 km<sup>2</sup> in 2019 and 38 km<sup>2</sup> in 2021.

**25. Valsad-** Its geographical area was 3029 km<sup>2</sup> which reduces to 3008 km<sup>2</sup> after resettlement of district boundaries. Very dense forest was altogether absent. Moderate dense forest area was 584 km<sup>2</sup> in 2003, 527 km<sup>2</sup> in 2005, 345 km<sup>2</sup> in 2009 to 2015, 344 km<sup>2</sup> in 2017, 343 km<sup>2</sup> in 2019 and 344 km<sup>2</sup> in 2021. Open forest area of was 411 km<sup>2</sup> in 2003, 458 km<sup>2</sup> 2005, 589 km<sup>2</sup> from 2009, 590 km<sup>2</sup> in 2011, 591 km<sup>2</sup> in 2013 & 2015, 594 km<sup>2</sup> in 2017, 642 km<sup>2</sup> in 2019 and 649 km<sup>2</sup> in 2021. Total forest area was 995 km<sup>2</sup> in 2003, 985 km<sup>2</sup> in 2005, 934 km<sup>2</sup> from 2009, 935 km<sup>2</sup> in 2011, 936 km<sup>2</sup> in 2013 & 2015, 938 km<sup>2</sup> in 2017, 985 km<sup>2</sup> in 2019 and 993 km<sup>2</sup> in 2021. Scrub forest area was 21 km<sup>2</sup> in 2005, 14 km<sup>2</sup> from 2009 to 2015, 27 km<sup>2</sup> in 2017 & 2019 and 21 km<sup>2</sup> in 2021.

**26. Tapi-** It is erected new after 2017 so its geographical area was 3139 km<sup>2</sup> with 80 km<sup>2</sup> very dense forest area and 476 km<sup>2</sup> moderate dense forest area in 2019 and 469 km<sup>2</sup> in 2021. It has 237 km<sup>2</sup> area under open forest area in 2019 and 236 km<sup>2</sup> in 2021. Total forest area was 792 km<sup>2</sup> in 2019 and 785 km<sup>2</sup> in 2021. Scrub forest area was 7 km<sup>2</sup> in 2019 and 6 km<sup>2</sup> in 2021.

Conclusion – Based on the data it was found that there is an increase of forest cover in some districts while in some it get decrease. Still the minimum required 33 percent forest cover is not achieved and there is need for not only government plantation work but involvement of people and awareness in young and school children's is needed so that future generation get clean environment.

### **CONCLUSION** –

Based on the data it was found that there is an increase of forest cover in some districts while in some it get decrease. Still the minimum required 33 percent forest cover is not achieved and there is need for not only government plantation work but involvement of people and awareness in young and school children's is needed so that future generation get clean environment.

TABLE-1 CHANGE IN MODERATE DENSE FOREST AREA OF GUJARAT FROM 2003-2019

| District |           |        |       |              |         |           |       |             |          |          |       |       |         |         |         |              |       |           |        |              |       |                |       |          |        |      |
|----------|-----------|--------|-------|--------------|---------|-----------|-------|-------------|----------|----------|-------|-------|---------|---------|---------|--------------|-------|-----------|--------|--------------|-------|----------------|-------|----------|--------|------|
| Year     | Ahmedabad | Amreli | Anand | Banas Kantha | Bharuch | Bhavnagar | Dahod | Gandhinagar | Jamnagar | Junagarh | Kutch | Kheda | Mehsana | Narmada | Navsari | Panch Mahals | Patan | Porbandar | Rajkot | Sabar Kantha | Surat | Surendra Nagar | Dangs | Vadodara | Valsad | Tapi |
| 2003     | 28        | 65     | 26    | 429          | 91      | 82        | 182   | 95          | 92       | 408      | 28    | 24    | 507     | 191     | 183     | 10           | 22    | 9         | 323    | 856          | 13    | 1013           | 163   | 584      |        |      |
| 2005     | 22        | 66     | 24    | 370          | 89      | 63        | 181   | 95          | 92       | 400      | 25    | 25    | 506     | 166     | 180     | 8            | 22    | 8         | 343    | 845          | 12    | 995            | 161   | 527      |        |      |
| 2009     | 14        | 63     | 18    | 369          | 76      | 52        | 163   | 65          | 95       | 301      | 20    | 19    | 465     | 125     | 178     | 4            | 16    | 4         | 304    | 776          | 8     | 745            | 144   | 345      |        |      |
| 2011     | 15        | 63     | 19    | 371          | 85      | 54        | 163   | 65          | 95       | 312      | 21    | 19    | 465     | 125     | 176     | 4            | 16    | 4         | 305    | 778          | 8     | 745            | 144   | 345      |        |      |
| 2013     | 14        | 63     | 18    | 369          | 76      | 52        | 163   | 65          | 95       | 301      | 20    | 19    | 465     | 125     | 179     | 4            | 16    | 4         | 304    | 776          | 8     | 745            | 144   | 345      |        |      |
| 2015     | 14        | 63     | 18    | 369          | 75      | 52        | 163   | 65          | 95       | 301      | 20    | 19    | 465     | 125     | 178     | 4            | 16    | 4         | 304    | 776          | 8     | 745            | 144   | 345      |        |      |
| 2017     | 12        | 63     | 18    | 272          | 71      | 47        | 118   | 11          | 95       | 301      | 20    | 13    | 464     | 125     | 219     | 1            | 16    | 3         | 304    | 294          | 6     | 743            | 145   | 344      |        |      |
| 2019     | 13        | 63     | 9     | 368          | 58      | 48        | 116   | 10          | 93       | 285      | 18    | 10    | 460     | 123     | 203     | 1            | 16    | 3         | 302    | 289          | 6     | 741            | 141   | 343      | 476    |      |
| Mean     | 16.5      | 63.6   | 18.8  | 364.6        | 77.6    | 77.6      | 156.1 | 7.9         | 54.8     | 326.1    | 21.5  | 18.5  | 474.6   | 138.1   | 187     | 4.5          | 17.5  | 4.9       | 311.1  | 673.8        | 8.6   | 809            | 148.3 | 397.3    | 476    |      |
| St. Err  | 2.0       | 0.4    | 1.8   | 15.2         | 3.8     | 3.8       | 9.0   | 0.7         | 0.8      | 17.2     | 1.2   | 1.8   | 7.0     | 9.1     | 5.5     | 1.1          | 1.0   | 0.8       | 5.1    | 84.2         | 0.9   | 42.6           | 3.0   | 35.0     | 0      |      |
| St. Dev. | 5.6       | 1.2    | 5.0   | 42.9         | 10.7    | 10.7      | 25.5  | 2.1         | 13.8     | 48.7     | 3.3   | 5.0   | 19.7    | 25.8    | 15.5    | 3.1          | 2.8   | 2.3       | 14.5   | 238.2        | 2.6   | 8.6            | 98.9  | 98.9     | 0      |      |



Figure 1: Change in Moderate Dense Forest Area of Gujarat from 2003- 2019

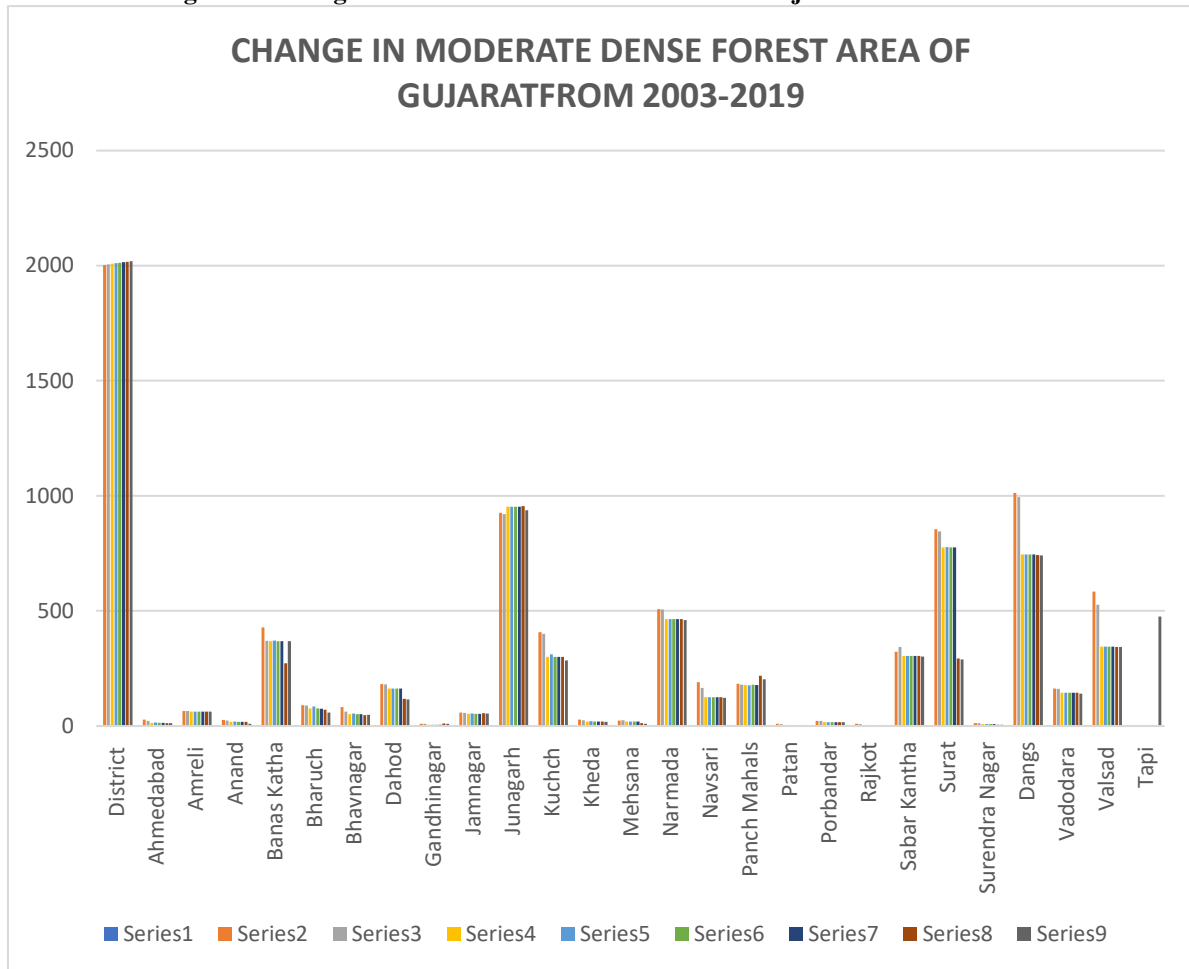


Figure 2: Change in Moderate Dense Forest Area of Gujarat from 2003- 2019

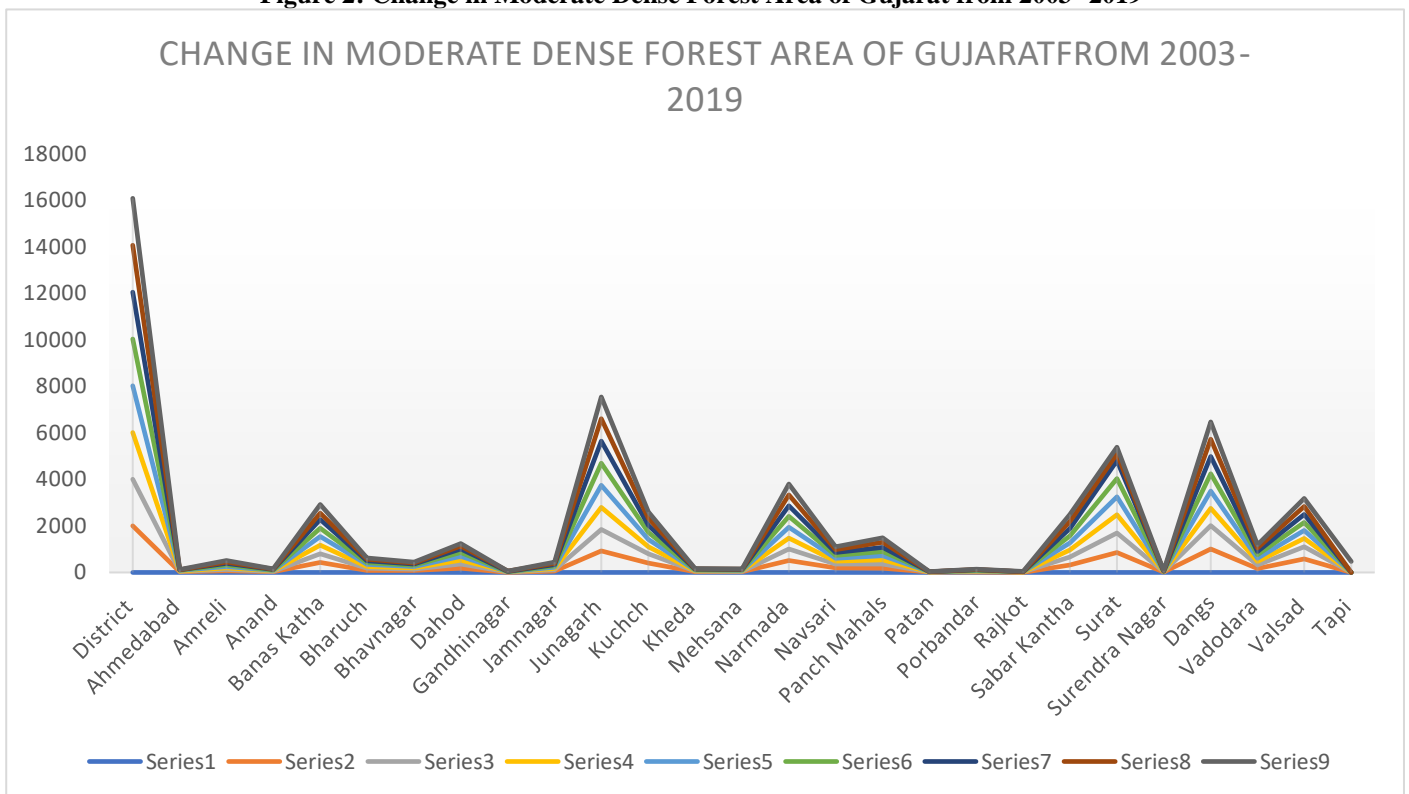


TABLE-2 CHANGE IN OPEN FOREST AREA OF GUJARAT FROM 2003-2019

| District |       |           |        |       |             |         |           |       |             |          |          |        |       |         |         |         |              |       |           |        |              |       |                |       |          |        |
|----------|-------|-----------|--------|-------|-------------|---------|-----------|-------|-------------|----------|----------|--------|-------|---------|---------|---------|--------------|-------|-----------|--------|--------------|-------|----------------|-------|----------|--------|
|          | Year  | Ahmedabad | Amreli | Anand | Banas Katha | Bharuch | Bhavnagar | Dahod | Gandhinagar | Jamnagar | Junagarh | Kuchch | Kheda | Mehsana | Narmada | Navsari | Panch Mahals | Patan | Porbandar | Rajkot | Sabar Kantha | Surat | Surendra Nagar | Dangs | Vadodara | Valsad |
| 2003     | 149   | 153       | 34     | 432   | 249         | 238     | 524       | 35    | 310         | 673      | 1875     | 74     | 213   | 498     | 123     | 393     | 89           | 92    | 139       | 476    | 471          | 159   | 363            | 465   | 411      |        |
| 2005     | 122   | 158       | 35     | 163   | 240         | 223     | 525       | 33    | 324         | 672      | 1839     | 73     | 195   | 494     | 141     | 385     | 78           | 96    | 139       | 458    | 467          | 160   | 339            | 460   | 458      |        |
| 2009     | 128   | 167       | 36     | 473   | 234         | 226     | 538       | 36    | 360         | 633      | 1999     | 74     | 196   | 474     | 147     | 394     | 79           | 104   | 137       | 468    | 445          | 165   | 414            | 479   | 589      |        |
| 2011     | 130   | 167       | 34     | 472   | 227         | 235     | 540       | 36    | 358         | 641      | 1995     | 74     | 195   | 474     | 145     | 394     | 79           | 107   | 137       | 470    | 454          | 165   | 414            | 479   | 590      |        |
| 2013     | 137   | 168       | 42     | 471   | 234         | 227     | 538       | 35    | 364         | 641      | 2011     | 74     | 195   | 474     | 147     | 393     | 81           | 108   | 138       | 472    | 455          | 165   | 414            | 482   | 591      |        |
| 2015     | 135   | 168       | 42     | 472   | 235         | 233     | 538       | 35    | 369         | 640      | 2005     | 75     | 195   | 474     | 147     | 392     | 81           | 108   | 138       | 472    | 456          | 165   | 414            | 484   | 591      |        |
| 2017     | 117   | 188       | 45     | 476   | 243         | 230     | 419       | 81    | 380         | 1634     | 2011     | 74     | 146   | 479     | 159     | 518     | 101          | 108   | 138       | 474    | 216          | 169   | 415            | 484   | 594      |        |
| 2019     | 118   | 197       | 41     | 455   | 219         | 245     | 413       | 82    | 417         | 740      | 2060     | 77     | 149   | 468     | 222     | 507     | 101          | 111   | 152       | 484    | 206          | 168   | 412            | 462   | 642      | 237    |
| Mean     | 129.5 | 170.8     | 38.6   | 426.8 | 235.1       | 232.1   | 504.4     | 46.3  | 360.3       | 784.3    | 1974.4   | 74.4   | 185.5 | 479.4   | 153.9   | 422.2   | 86.1         | 104.3 | 139.8     | 471.8  | 396.3        | 164.5 | 398.1          | 474.4 | 558.3    | 237    |
| St. Err  | 3.8   | 5.2       | 1.5    | 38.0  | 3.3         | 2.5     | 19.4      | 7.6   | 11.6        | 122.0    | 26.8     | 0.4    | 8.6   | 3.8     | 10.4    | 19.8    | 3.5          | 2.4   | 1.8       | 2.6    | 40.5         | 1.2   | 10.5           | 3.6   | 28.1     | 0.0    |
| St. Dev. | 10.8  | 14.7      | 4.3    | 107.6 | 9.3         | 7.2     | 54.9      | 21.5  | 32.8        | 345.1    | 75.8     | 1.2    | 24.3  | 10.7    | 29.3    | 56.0    | 9.8          | 6.7   | 5.0       | 7.4    | 114.6        | 3.5   | 29.8           | 10.2  | 79.4     | 0.0    |



Figure 3: Change in Open Area of Gujarat from 2003- 2019

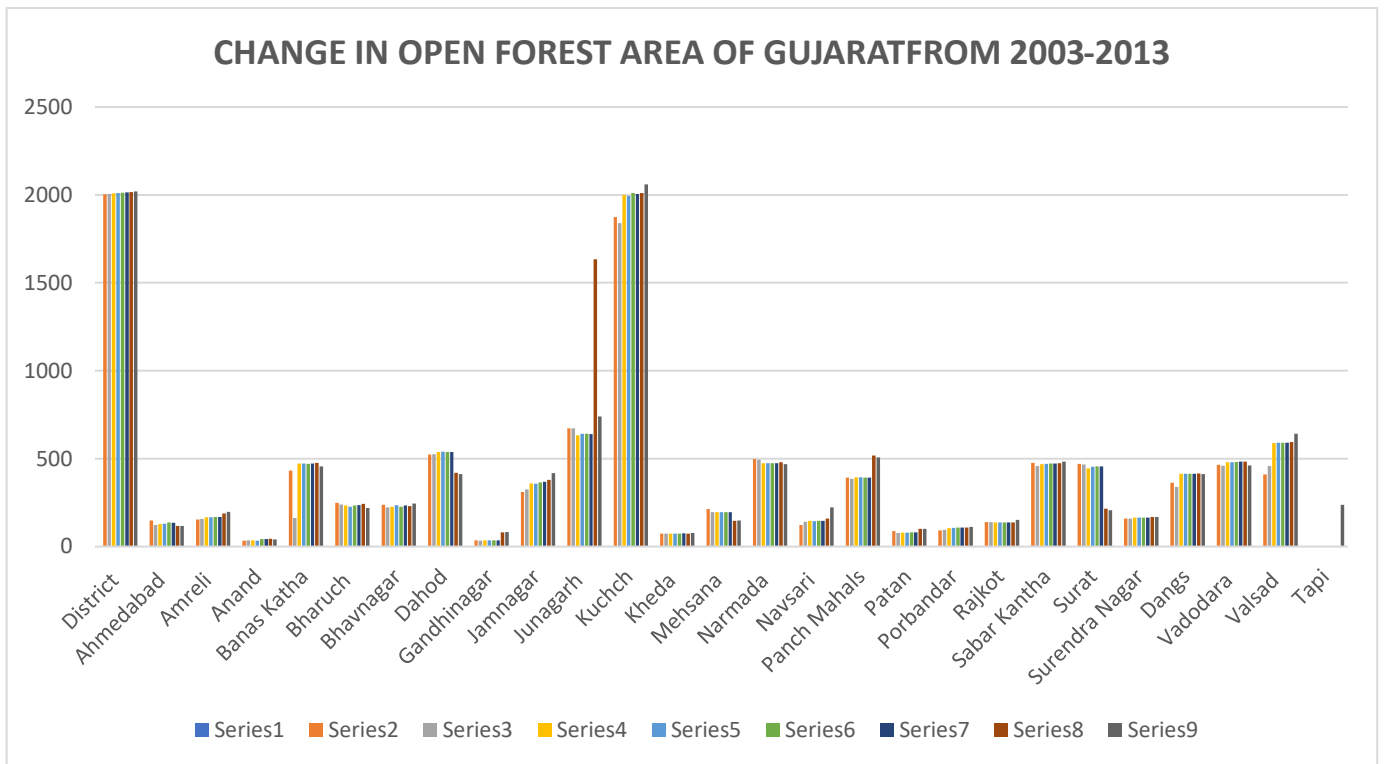


Figure 4: Change in Open Area of Gujarat from 2003- 2019

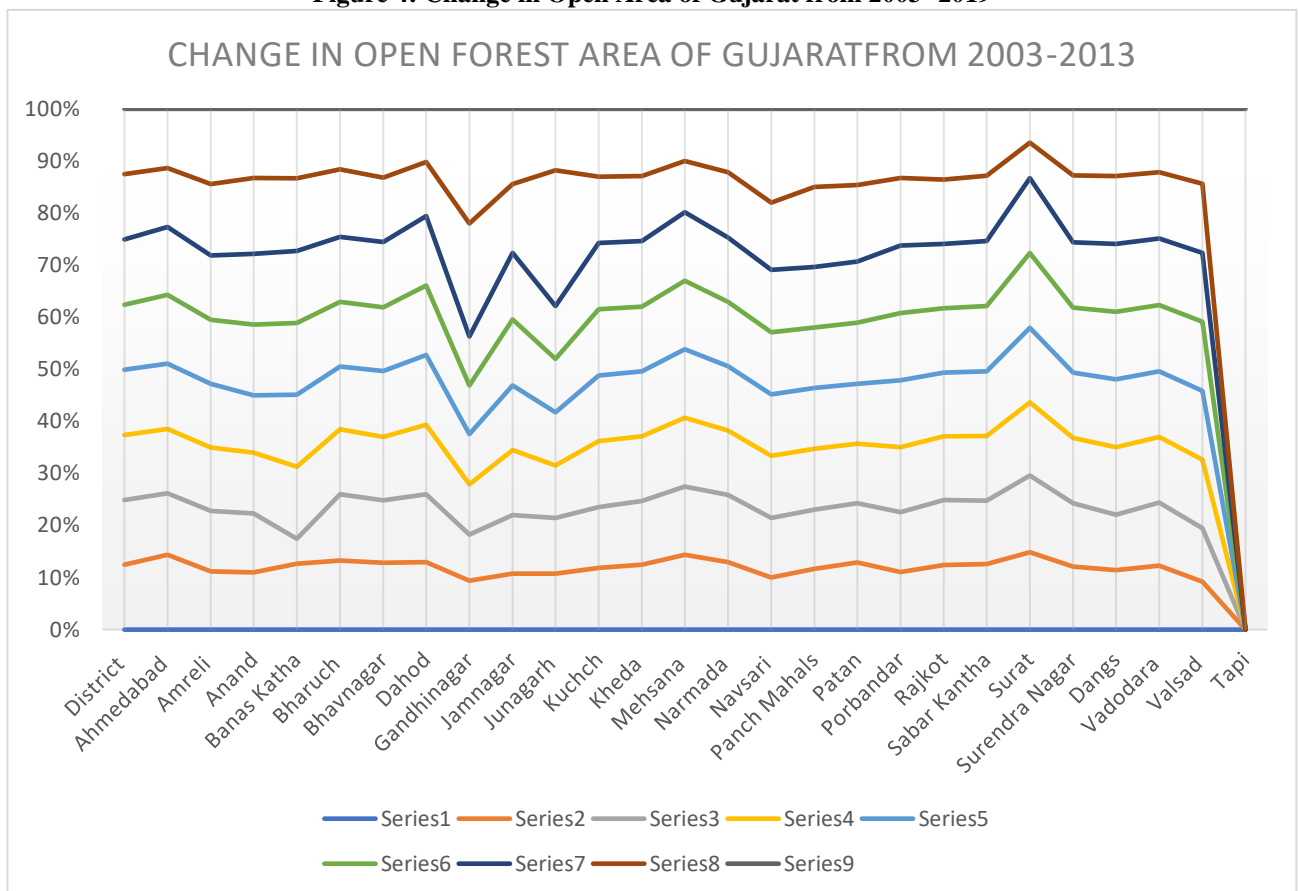


TABLE-3 CHANGE IN SCRUB FOREST AREA OF GUJARAT FROM 2005-2019

| District |           |        |       |             |         |           |       |             |          |          |        |       |         |         |         |              |       |           |        |              |       |                |       |          |        |      |
|----------|-----------|--------|-------|-------------|---------|-----------|-------|-------------|----------|----------|--------|-------|---------|---------|---------|--------------|-------|-----------|--------|--------------|-------|----------------|-------|----------|--------|------|
| Year     | Ahmedabad | Amreli | Anand | Banas Katha | Bharuch | Bhavnagar | Dahod | Gandhinagar | Jamnagar | Junagarh | Kuchch | Kheda | Mehsana | Narmada | Navsari | Panch Mahals | Patan | Porbandar | Rajkot | Sabar Kantha | Surat | Surendra Nagar | Dangs | Vadodara | Valsad | Tapi |
| 2005     | 16        | 41     | 4     | 189         | 7       | 75        | 40    | 2           | 72       | 34       | 521    | 19    | 54      | 22      | 1       | 41           | 28    | 18        | 31     | 110          | 24    | 111            | 0     | 33       | 2      |      |
| 2009     | 17        | 36     | 4     | 184         | 3       | 75        | 35    | 2           | 64       | 24       | 571    | 16    | 51      | 19      | 6       | 35           | 24    | 16        | 29     | 90           | 26    | 92             | 3     | 27       | 14     |      |
| 2011     | 14        | 36     | 5     | 186         | 5       | 79        | 36    | 2           | 66       | 23       | 564    | 16    | 50      | 21      | 8       | 35           | 24    | 16        | 34     | 91           | 32    | 92             | 3     | 27       | 14     |      |
| 2013     | 14        | 37     | 5     | 186         | 5       | 78        | 36    | 2           | 65       | 24       | 576    | 16    | 49      | 21      | 8       | 36           | 25    | 16        | 33     | 91           | 33    | 92             | 3     | 27       | 14     |      |
| 2015     | 14        | 37     | 5     | 186         | 5       | 78        | 36    | 2           | 65       | 24       | 576    | 15    | 49      | 21      | 8       | 36           | 25    | 16        | 32     | 91           | 33    | 92             | 3     | 27       | 14     |      |
| 2017     | 52        | 66     | 19    | 208         | 26      | 76        | 45    | 50          | 99       | 60       | 752    | 37    | 64      | 32      | 15      | 57           | 126   | 20        | 37     | 130          | 90    | 26             | 2     | 60       | 27     |      |
| 2019     | 41        | 91     | 91    | 154         | 14      | 85        | 30    | 52          | 158      | 95       | 1520   | 36    | 46      | 25      | 10      | 49           | 116   | 40        | 95     | 112          | 92    | 48             | 30    | 43       | 27     | 7    |
| Mean     | 24        | 49     | 19    | 184         | 93      | 78        | 39    | 16          | 84       | 40       | 725    | 22    | 51      | 23      | 8       | 41           | 26    | 40        | 41     | 102          | 47    | 79             | 63    | 34       | 16     | 7    |
| St. Err  | 5.9       | 8.1    | 12.2  | 6           | 3.1     | 1.3       | 1.8   | 9           | 13.2     | 10.4     | 135.3  | 3.7   | 2.2     | 1.6     | 1.6     | 3.2          | 17.7  | 3.3       | 9      | 5.9          | 11.4  | 11.4           | 4     | 4.8      | 3.3    | 0    |
| St. Dev. | 15.7      | 21.4   | 32.2  | 15.9        | 8.2     | 3.5       | 4.6   | 23.9        | 34.9     | 27.4     | 357.9  | 9.9   | 5.9     | 4.4     | 4.2     | 8.6          | 46.9  | 8.8       | 23.7   | 15.6         | 30.2  | 30.2           | 10.5  | 12.6     | 8.7    | 0    |

Figure 5: Change in Scrub Area of Gujarat from 2003- 2019

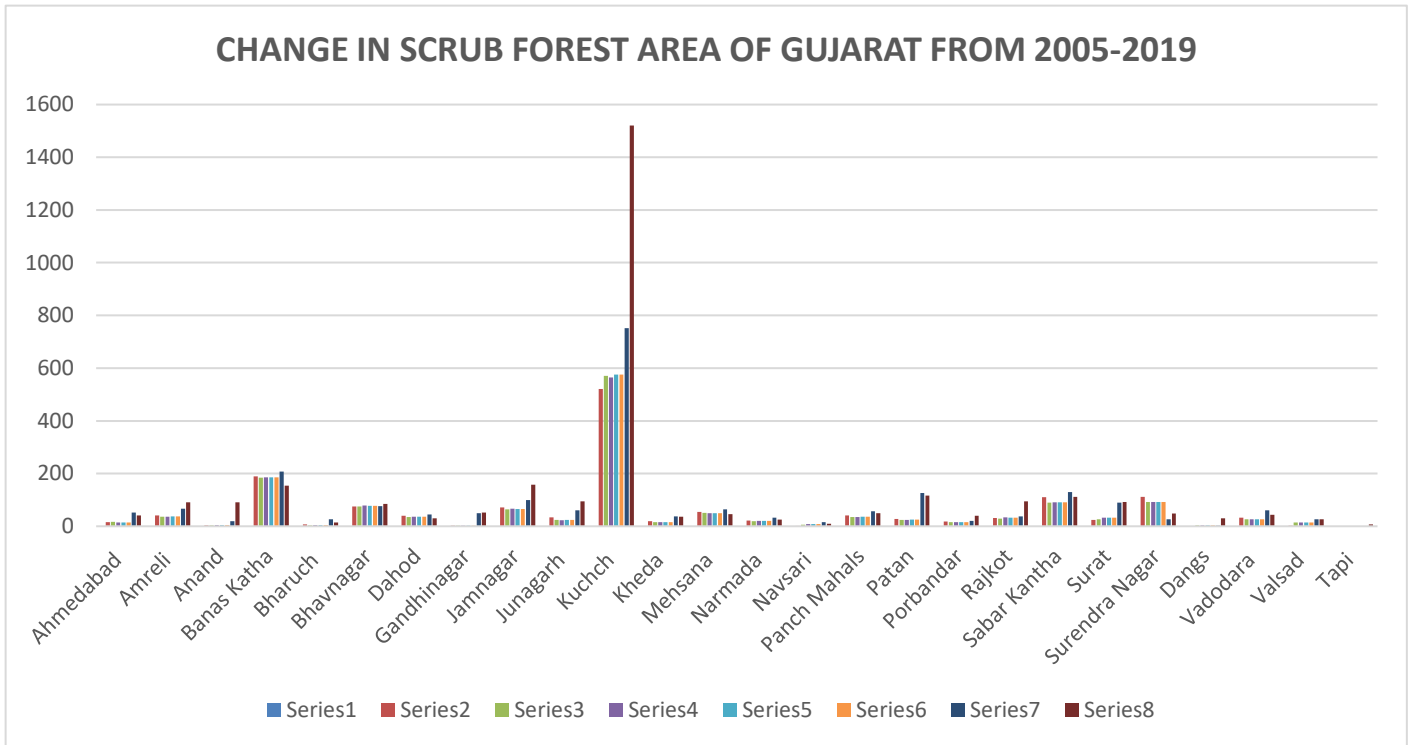


Figure 6: Change in Scrub Area of Gujarat from 2003- 2019

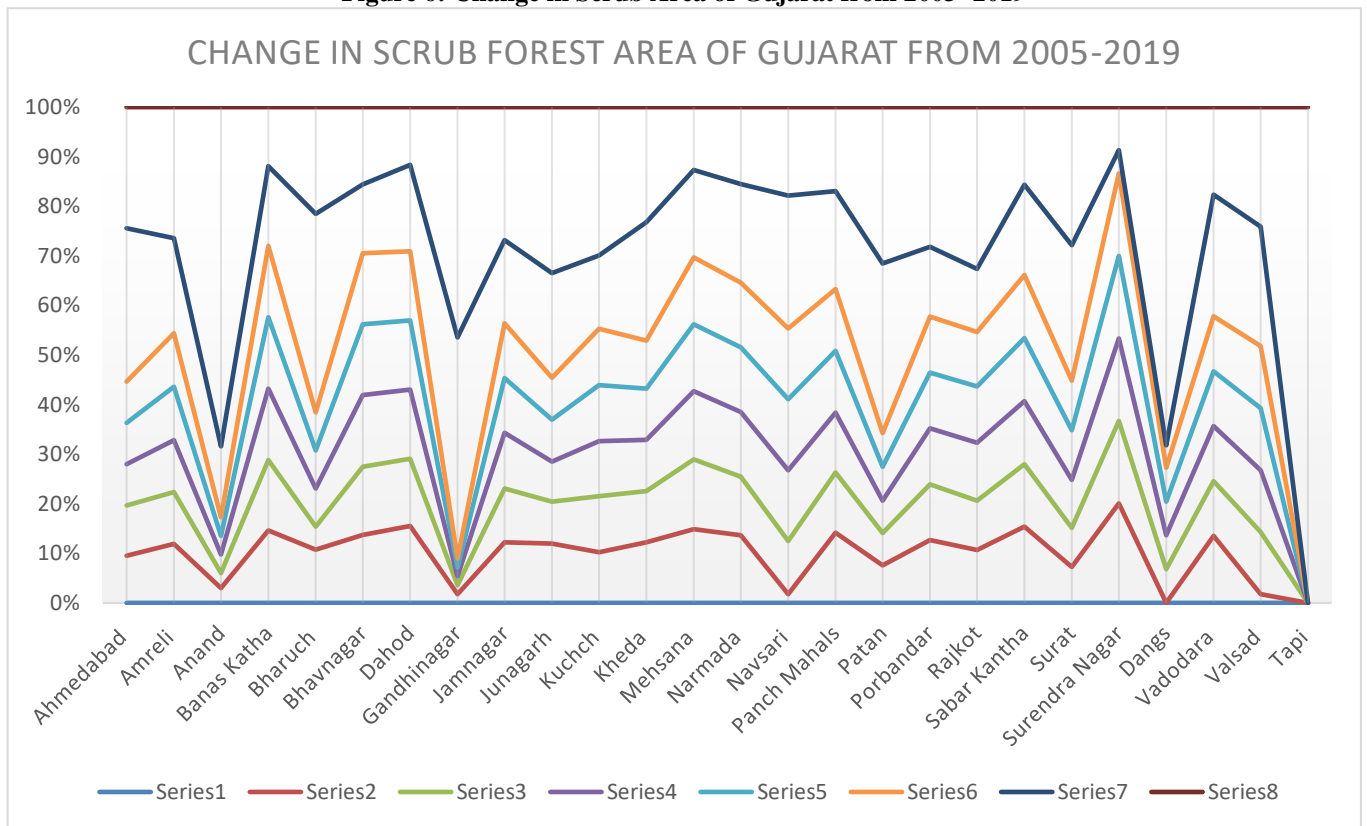


TABLE-4 CHANGE IN TOTAL FOREST AREA OF GUJARAT FROM 2003-2019

| District    |      |           |        |       |             |         |           |       |             |          |          |        |       |         |         |         |              |       |           |        |              |       |          |       |          |        |
|-------------|------|-----------|--------|-------|-------------|---------|-----------|-------|-------------|----------|----------|--------|-------|---------|---------|---------|--------------|-------|-----------|--------|--------------|-------|----------|-------|----------|--------|
|             | Year | Ahmedabad | Amreli | Anand | Banas Katha | Bharuch | Bhavnagar | Dahod | Gandhinagar | Jamnagar | Junagarh | Kuchch | Kheda | Mehsana | Narmada | Navsari | Panch Mahals | Patan | Porbandar | Rajkot | Sabar Kantha | Surat | Surendra | Dangs | Vadodara | Valsad |
| 2003        | 1777 | 2188      | 600    | 3400  | 3400        | 3220    | 7006      | 444   | 3669        | 1608     | 2283     | 1002   | 2337  | 1005    | 314     | 576     | 99           | 114   | 148       | 799    | 1354         | 1722  | 1417     | 628   | 995      |        |
| 2005        | 1444 | 2244      | 599    | 3229  | 3229        | 2886    | 7006      | 442   | 3881        | 1601     | 2239     | 988    | 2200  | 1007    | 300     | 565     | 86           | 118   | 147       | 801    | 1339         | 1722  | 1412     | 621   | 985      |        |
| 2009        | 1433 | 2300      | 555    | 3119  | 3119        | 2880    | 7002      | 442   | 4144        | 1600     | 2311     | 955    | 2115  | 959     | 2990    | 570     | 83           | 120   | 141       | 802    | 1307         | 1733  | 1368     | 623   | 934      |        |
| 2011        | 1444 | 2300      | 552    | 3008  | 3008        | 2887    | 7004      | 442   | 4122        | 1608     | 2299     | 944    | 2149  | 988     | 288     | 70      | 83           | 123   | 141       | 804    | 1316         | 1733  | 1368     | 623   | 935      |        |
| 2013        | 1511 | 2311      | 600    | 3100  | 3100        | 2779    | 7002      | 441   | 4177        | 1608     | 2312     | 944    | 2144  | 959     | 2990    | 571     | 85           | 124   | 142       | 805    | 1315         | 1733  | 1368     | 626   | 936      |        |
| 2015        | 1449 | 2311      | 600    | 3100  | 3100        | 2885    | 7002      | 441   | 4222        | 1607     | 2306     | 954    | 2149  | 959     | 2990    | 571     | 85           | 124   | 142       | 805    | 1316         | 1736  | 1368     | 628   | 936      |        |
| 2017        | 1229 | 2511      | 633    | 3114  | 3114        | 2777    | 5338      | 922   | 4335        | 1634     | 2312     | 944    | 1599  | 963     | 302     | 737     | 102          | 124   | 141       | 807    | 515          | 1735  | 1368     | 629   | 938      |        |
| 2019        | 1311 | 2600      | 500    | 2778  | 2778        | 2993    | 5330      | 922   | 4771        | 1693     | 2345     | 944    | 1599  | 948     | 362     | 710     | 103          | 127   | 154       | 815    | 500          | 1744  | 1363     | 603   | 985      | 792    |
| MEAN        | 146  | 2344      | 574    | 3135  | 3135        | 2884    | 6613      | 545   | 4151        | 1619     | 2300     | 958    | 2064  | 865     | 3054    | 5463    | 908          | 1218  | 1445      | 8048   | 11203        | 1735  | 1379     | 626   | 955      | 792    |
| ST .<br>ERR | 5.2  | 4.9       | 1.6    | 6.4   | 6.4         | 4.9     | 27.8      | 8.2   | 11.1        | 11.1     | 10.8     | 1.0    | 10.2  | 0.8     | 8.8     | 72.3    | 3.1          | 1.5   | 1.7       | 1.7    | 133.8        | 0.5   | 7.8      | 3.0   | 9.7      | 0      |
| ST .<br>DEV | 14.8 | 14.0      | 4.5    | 18.1  | 18.1        | 13.8    | 78.6      | 23.2  | 31.3        | 31.4     | 30.4     | 2.9    | 28.8  | 30.6    | 24.8    | 204.6   | 8.9          | 4.2   | 4.8       | 4.9    | 378.5        | 1.4   | 22.0     | 8.4   | 27.4     | 0      |

Figure 7: Change in Total Area of Gujarat from 2003- 2019

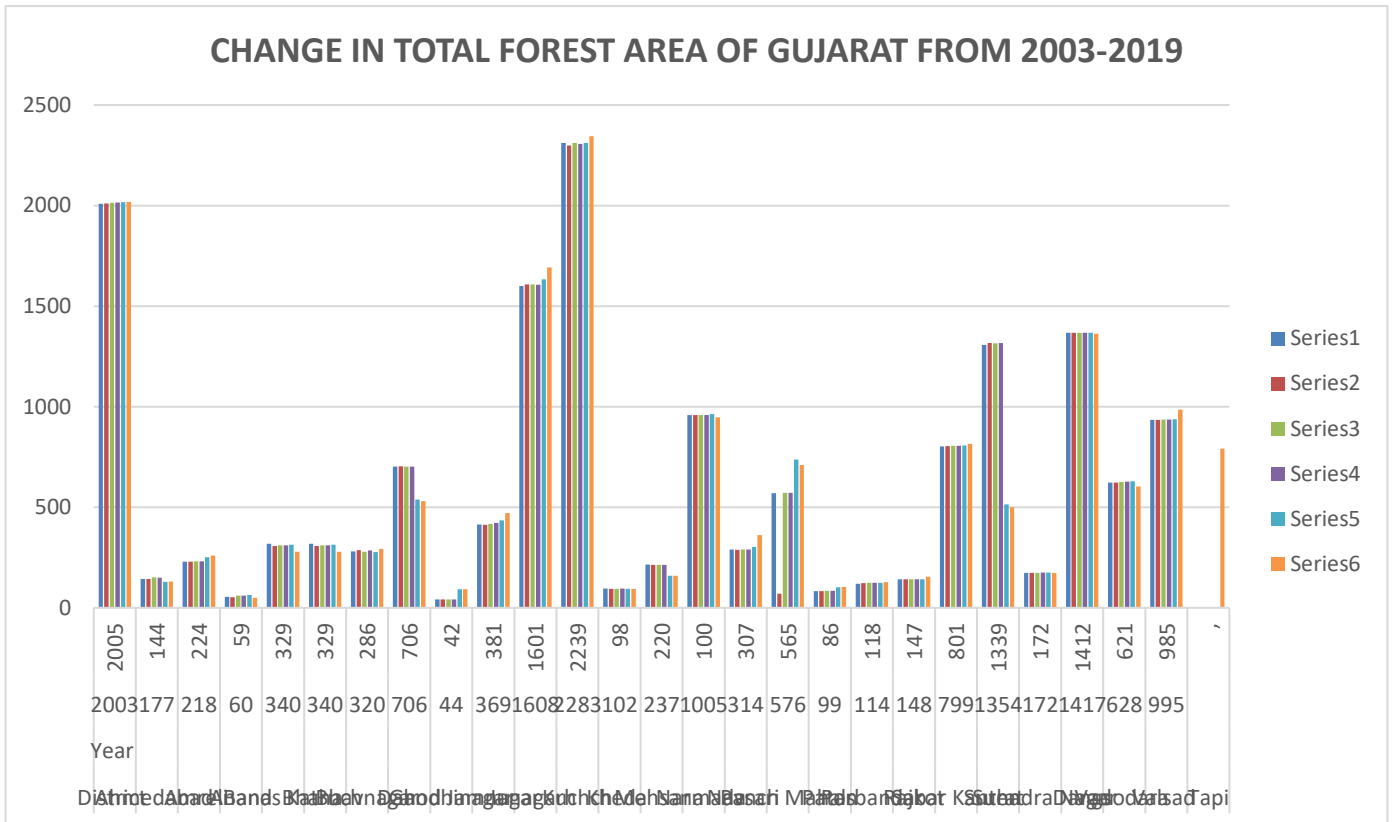
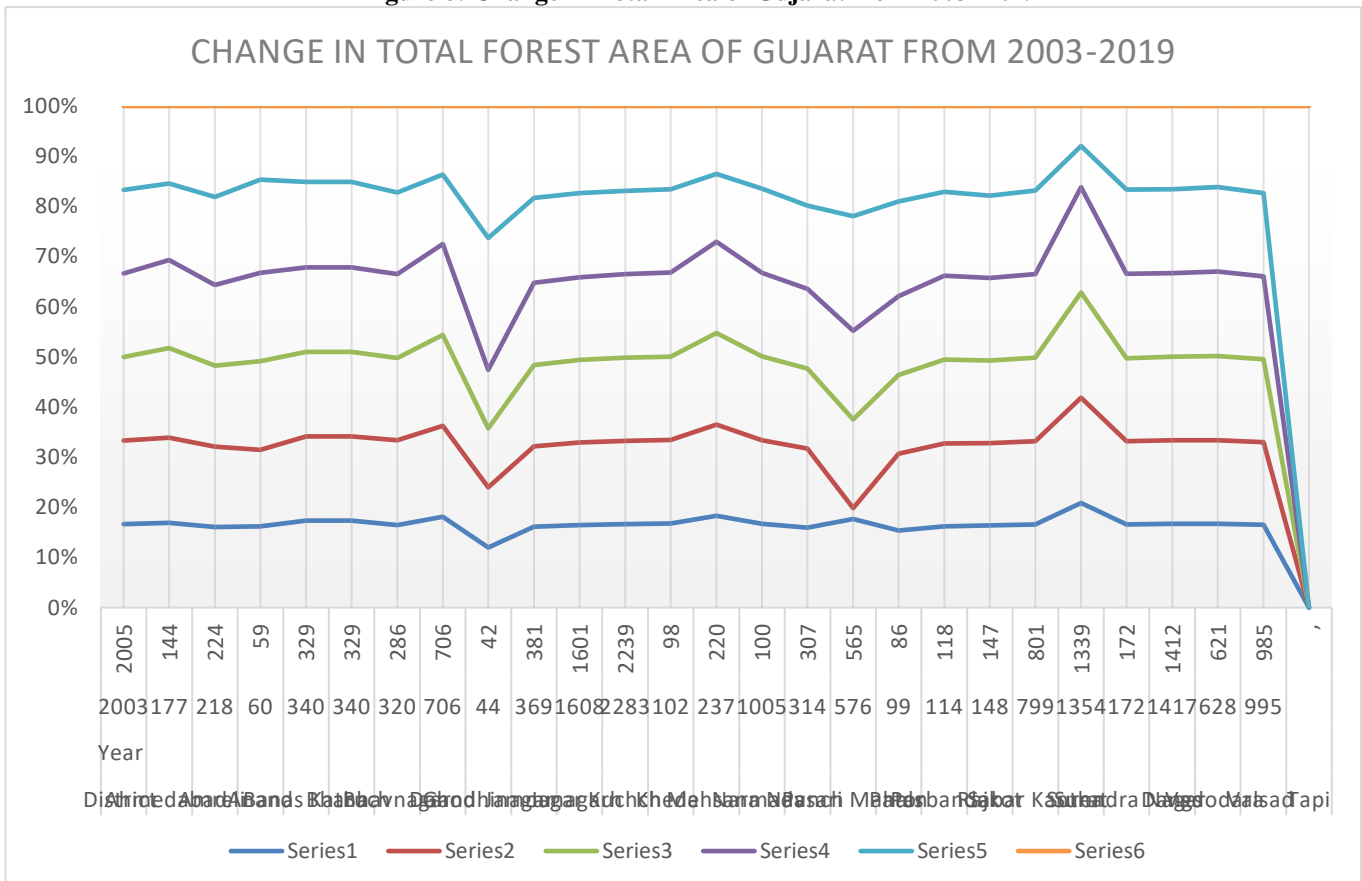


Figure 8: Change in Total Area of Gujarat from 2003- 2019



**TABLE-5 CHANGE IN VERY DENSE FOREST AREA OF GUJARAT FROM 2003-2019**

| District | Ahmedabad | Amreli | Anand | Banas Katha | Bharuch | Bhavnagar | Dahod | Gandhinagar | Jamnagar | Junagarh | Kuchch | Kheda | Mehsana | Narmada | Navsari | Panch Mahals | Patan | Porbandar | Rajkot | Sabar Kantha | Surat | Surendra Nagar | Dangs | Vadodara | Valsad | Tapi |    |
|----------|-----------|--------|-------|-------------|---------|-----------|-------|-------------|----------|----------|--------|-------|---------|---------|---------|--------------|-------|-----------|--------|--------------|-------|----------------|-------|----------|--------|------|----|
| Year     |           |        |       |             |         |           |       |             |          |          |        |       |         |         |         |              |       |           |        |              |       |                |       |          |        |      |    |
| 2003     | 0         | 0      | 0     | 0           | 0       | 0         | 0     | 0           | 0        | 9        | 0      | 0     | 0       | 0       | 0       | 0            | 0     | 0         | 0      | 0            | 0     | 27             | 0     | 78       | 0      | 0    |    |
| 2005     | 0         | 0      | 0     | 0           | 0       | 0         | 0     | 0           | 0        | 9        | 0      | 0     | 0       | 0       | 0       | 0            | 0     | 0         | 0      | 0            | 0     | 27             | 0     | 78       | 0      | 0    |    |
| 2009     | 0         | 0      | 0     | 0           | 0       | 0         | 1     | 0           | 0        | 15       | 0      | 0     | 0       | 20      | 18      | 0            | 0     | 0         | 0      | 0            | 29    | 84             | 0     | 209      | 0      | 0    |    |
| 2011     | 0         | 0      | 0     | 0           | 0       | 0         | 1     | 0           | 0        | 15       | 0      | 0     | 0       | 20      | 18      | 0            | 0     | 0         | 0      | 0            | 29    | 84             | 0     | 209      | 0      | 0    |    |
| 2013     | 0         | 0      | 0     | 0           | 0       | 0         | 1     | 0           | 0        | 15       | 0      | 0     | 0       | 20      | 18      | 0            | 0     | 0         | 0      | 0            | 29    | 84             | 0     | 209      | 0      | 0    |    |
| 2015     | 0         | 0      | 0     | 0           | 0       | 0         | 1     | 0           | 0        | 15       | 0      | 0     | 0       | 20      | 18      | 0            | 0     | 0         | 0      | 0            | 29    | 84             | 0     | 209      | 0      | 0    |    |
| 2017     | 0         | 0      | 0     | 0           | 0       | 0         | 1     | 0           | 0        | 15       | 0      | 0     | 0       | 20      | 110     | 0            | 0     | 0         | 0      | 0            | 29    | 5              | 0     | 210      | 0      | 0    |    |
| 2019     | 0         | 0      | 0     | 0           | 0       | 0         | 1     | 0           | 0        | 15       | 0      | 0     | 0       | 20      | 18      | 0            | 0     | 0         | 0      | 0            | 29    | 5              | 0     | 210      | 0      | 0    | 80 |
| MEAN     | 0         | 0      | 0     | 0           | 0       | 0.8       | 0     | 0           | 0        | 13.5     | 0      | 0     | 0       | 15      | 25      | 0            | 0     | 0         | 0      | 0            | 21.8  | 50             | 0     | 176.5    | 0      | 0    | 80 |
| STERR    | 0         | 0      | 0     | 0           | 0       | 0.2       | 0     | 0           | 0        | 1        | 0      | 0     | 0       | 3.3     | 12.5    | 0            | 0     | 0         | 0      | 0            | 4.8   | 13.2           | 0     | 21.5     | 0      | 0    | 0  |
| ST. DEV  | 0         | 0      | 0     | 0           | 0       | 0.5       | 0     | 0           | 0        | 2.8      | 0      | 0     | 0       | 9.3     | 35.3    | 0            | 0     | 0         | 0      | 0            | 13.4  | 37.3           | 0     | 60.8     | 0      | 0    | 0  |

**Figure 9: Change in Very Dense Area of Gujarat from 2003- 2019**

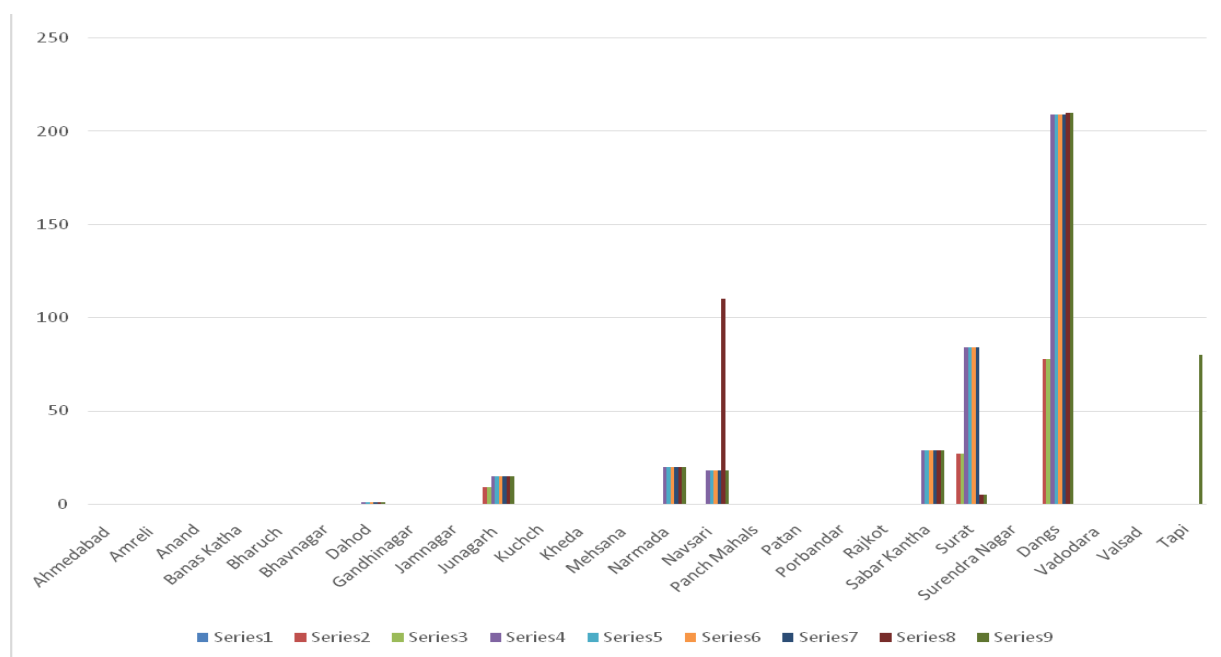
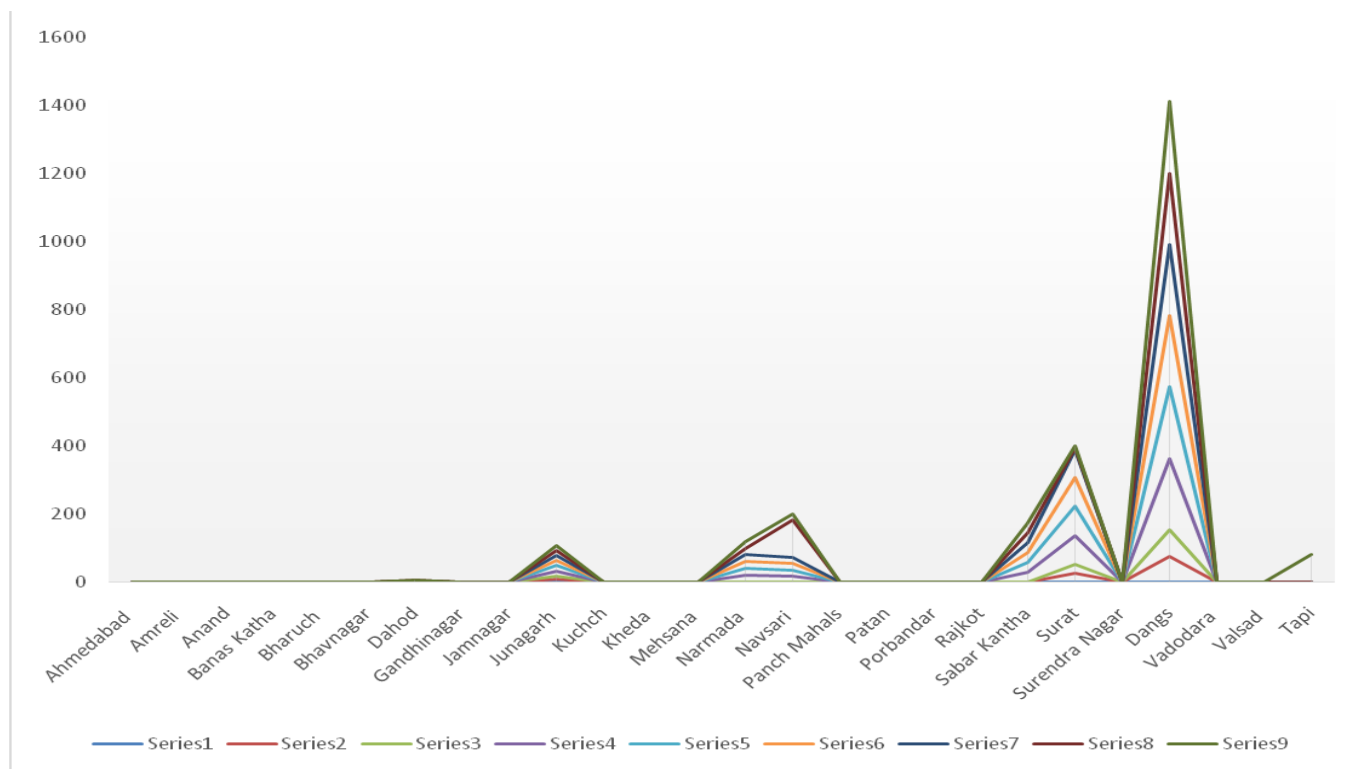




Figure 10: Change in Very Dense Area of Gujarat from 2003- 2019



References:

1. FSI. (2003). Gujarat, India State of Forest Report 2003. Ministry of Environment, Forest & Climate Change, Government of India. Page No. 82-86.
2. FSI. (2005). Gujarat, India State of Forest Report 2005. Ministry of Environment, Forest & Climate Change, Government of India. Page No. 71-74.
3. FSI. (2009). Gujarat, India State of Forest Report 2009. Ministry of Environment, Forest & Climate Change, Government of India. Page No. 82-86.
4. FSI. (2011). Gujarat, India State of Forest Report 2011. Ministry of Environment, Forest & Climate Change, Government of India. Page No. 127-133.
5. FSI. (2013). Gujarat, India State of Forest Report 2013. Ministry of Environment, Forest & Climate Change, Government of India. Page No. 121-125.
6. FSI. (2015). Gujarat, India State of Forest Report 2015. Ministry of Environment, Forest & Climate Change, Government of India. Page No. 143-149.
7. FSI. (2017). Gujarat, India State of Forest Report 2017. Ministry of Environment, Forest & Climate Change, Government of India. Page No. 182-187.
8. FSI. (2019). Gujarat, India State of Forest Report 2019. Ministry of Environment, Forest & Climate Change, Government of India. Page No. 71-81.
9. FSI. (2021). Gujarat, India State of Forest Report 2021. Ministry of Environment, Forest & Climate Change, Government of India. Page No. 315-324.