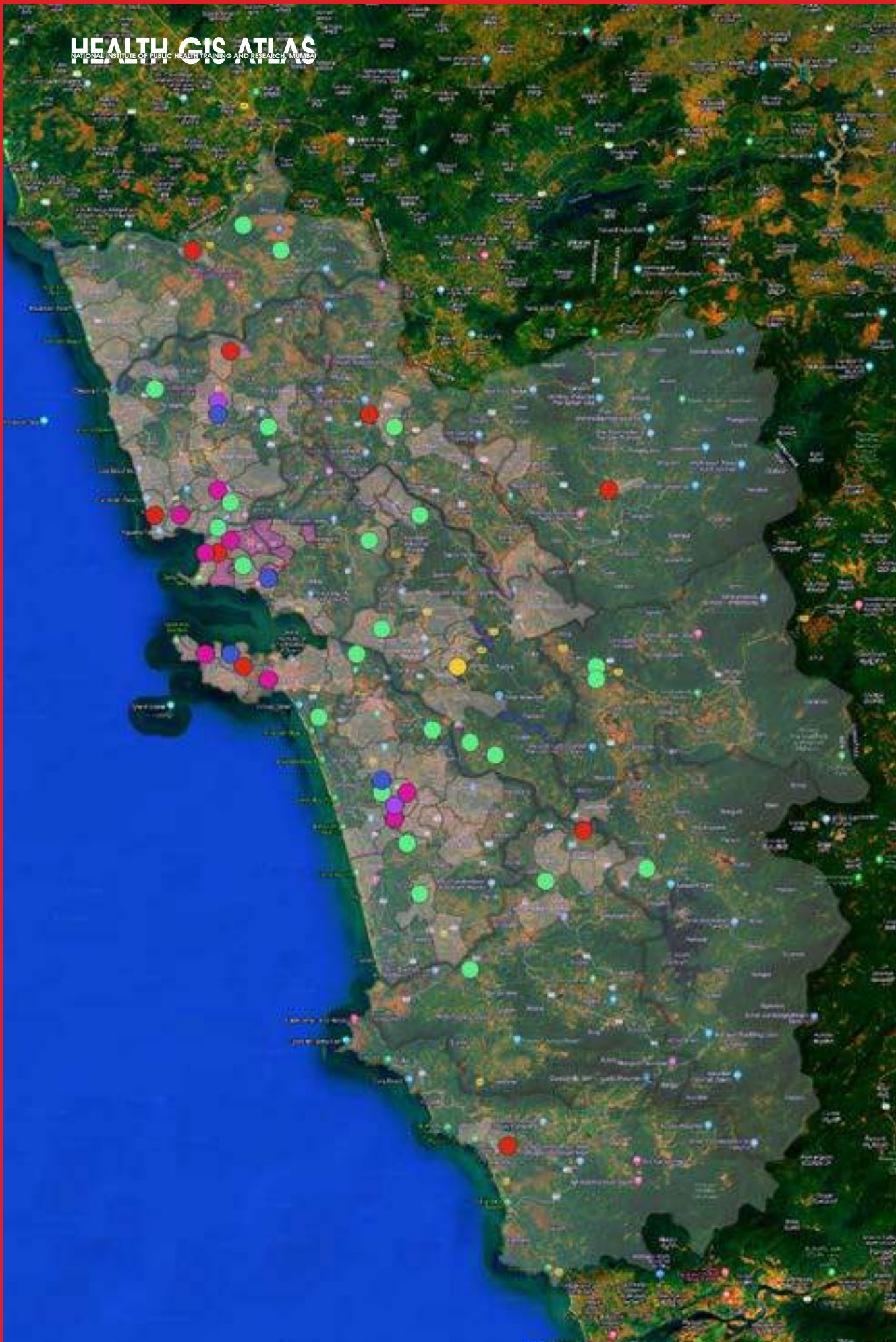




सत्यमेव जयते

HEALTH GIS ATLAS



Geo-mapping of Distribution and Performance of Public Health Facilities and Spatial analysis of burden of HIV/AIDS at habitat level, of Goa SACS



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Abbreviations :

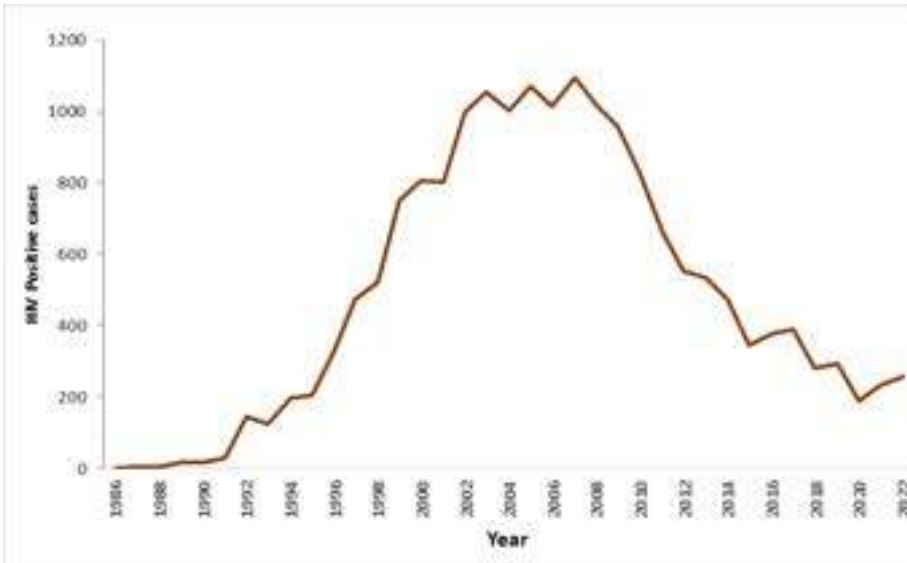
AIDS	: Acquired immunodeficiency syndrome
ANC	: Ante Natal Care
ART	: Anti-Retro Viral therapy
CHC	: Community health centre
DH	: District hospital
DSRC	: Designated STI/RTI Clinic
EID	: Early Infant Diagnosis
FICTC	: Facility Integrated Counselling and Testing Centre.
FSW	: Female Sex Worker
GC	: General Client
GIS	: Geographic Information System
GOA SACS	: GOA State AIDS Control Society
HIV	: Human Immunodeficiency Virus
ICTC	: Integrated Counselling and Testing Centres
IDU	: Injecting drug users (Intravenous drug users)
LAC PLUS	: Link Anti retro viral therapy plus centres
MSM	: Men Who Have sex with Men
NGO	: Non-Governmental organizations
PLHIV	: People living with Human Immunodeficiency Virus
PPP-FICTC	: Public Private Partnership -Facility Integrated Counselling and Testing Centre
PPTCT	: Prevention of Parent to Child Transmission (PPTCT)
PW	: Pregnant women
UNAIDS	: United Nations Programme on HIV/AIDS (UNAIDS)

GIS (Geographic Information System) is a useful tool that aids and assists in planning, monitoring evaluation, Health education and coverages of services of health programmes. It also plays a vital role in strengthening the whole process of epidemiological surveillance, information management and analysis. Generally, the objectives of GIS are the management (acquisition, storage and maintenance), analysis (statistical and spatial) and display (graphics and mapping) of geographical data and hence producing meaningful results. The representation and analysis of maps of disease incidence data are basic tools in the analysis of regional variation in public health. The development of methods for mapping disease incident has progressed considerably in recent years. It is evident that many questions concerning the provision of health care are related to space. People are distributed in space and not evenly. Health problems vary in space and so do the needs of the people. Location of health centres and services offered by these to cater the needs of populations varying in number, dimension and densities can be addressed and resolved with spatial analysis tools. NIPHTR in collaboration with Goa SACS mapped all the infrastructure and programmatic indicators at health facility and habitat level. The main objective of GIS mapping is to assess the utility of the infrastructure of SACS in context with productive and performance of surveillance, diagnosis and treatment and identified high and low HIV /AIDS burden pockets.

HIV/AIDS problem in Goa is nearly 36 years old. In this period, it has emerged as public health concerns. The available sentinel surveillance data clearly indicates that HIV infection is prevalent in almost all parts of Goa and in recent years has spread from urban to rural and from individuals practicing high-risk behaviour to general population. With no vaccine or cure till date, prevention is the only way to control the epidemic through promotion of behavioral changes, adoption of healthy lifestyle and reduction of risk of infection. In order to alleviate the epidemics devastating social and economic impact, concerted efforts are being made at all levels to control the spread of infection, reduce peoples vulnerability to HIV and to promote community and family-based care to HIV/AIDS cases under AIDS Control Programme. In Goa HIV/ AIDS control programme was launched in May 1992 with the setting up of the "AIDS Cell" under the Directorate of Health Services. Goa State AIDS Control Society (GSACS) was established in April 1999. For effective control and prevention of the epidemic, GSACS primarily facilitates and directs various activities at the State and local levels

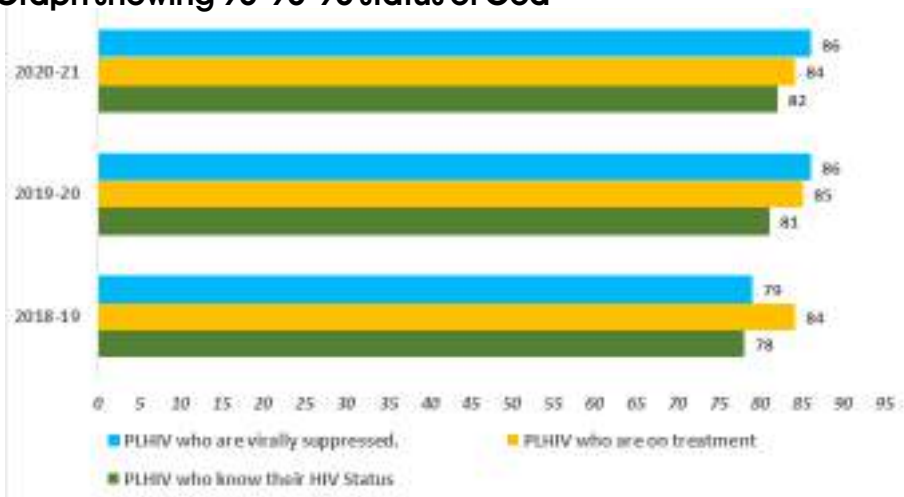
Achievement and progress of Goa SACS:

Trend of HIV Positive cases in Goa since 1986 till 2022



This line graph illustrates the trend of HIV positive cases in Goa since 1986. According to the graph, while no cases were reported until 1989, there was a significant surge in HIV-positive cases from 1991 to 2008. Subsequently, there was a decline observed until 2022, which can be attributed to various initiatives implemented by governmental and non-governmental organizations in the sector. These initiatives include health education, strengthening surveillance, early diagnosis, and treatment etc .

Graph showing 95-95-95 status of Goa



The bar graph shows the progress made by Goa in relation to UNAIDS' ambitious 95-95-95 goals. As of 2021, 82 percent of people living with HIV know their HIV status in Goa, compared to 78% in 2018. 84% of people who are diagnosed with HIV are receiving anti-retroviral therapy, and 86% of those who are on ART achieved viral suppression in 2021, compared to the respective 84% and 79% in 2018. There is a remarkable increase in achieving viral suppression, but more focus needs to be given to diagnosing the new cases as well as starting the ART regimen for the newly diagnosed cases.

Methodology and Geomap of the state of Goa

Mapping area- Goa State, subdistrict and habitat

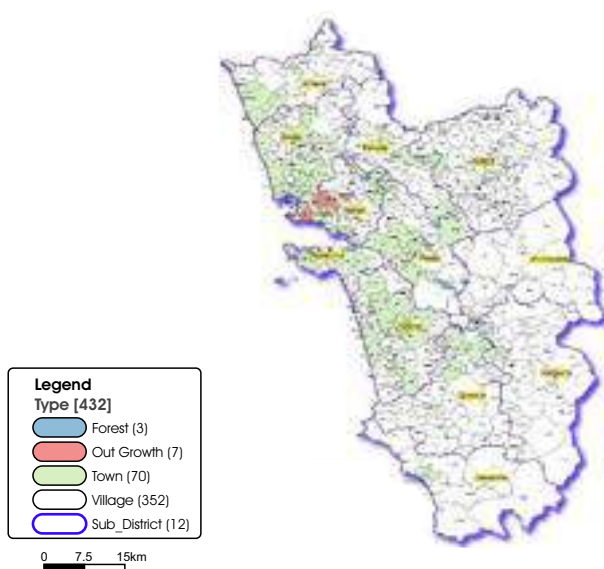
Mapping duration- 1st Nov 2022 to March 2023.

Mapping Variable- Infrastructure (ICTCs, FICTCs, NGOs, NGO Area, ART center, EID centers) and some programmatic indicators (PLHIV cumulative at habitat level, Urban and Rural area etc).

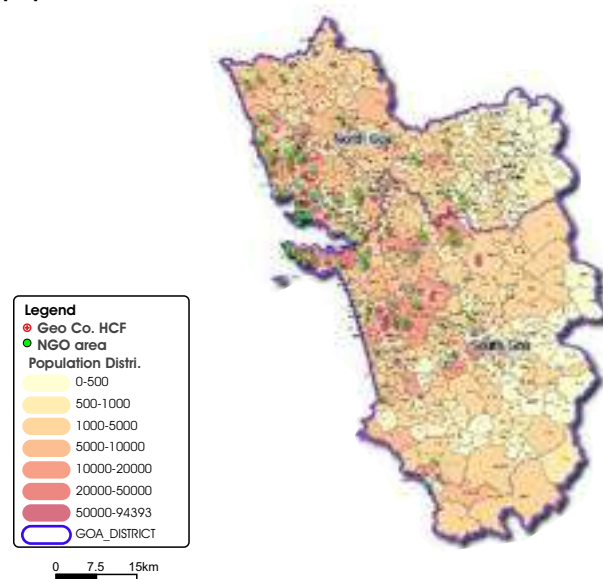
GIS files and data linkage - Geo coordinates were captured for infrastructure of programme and converted into vector files. Vector files of habitat are joined with data variables.

GIS software: Opensource for plotting of GIS maps

Villages, towns and outgrowth areas at Subdistrict level of State of Goa.



Distribution of Health care facilities, stratification of population of Habitate of State of Goa

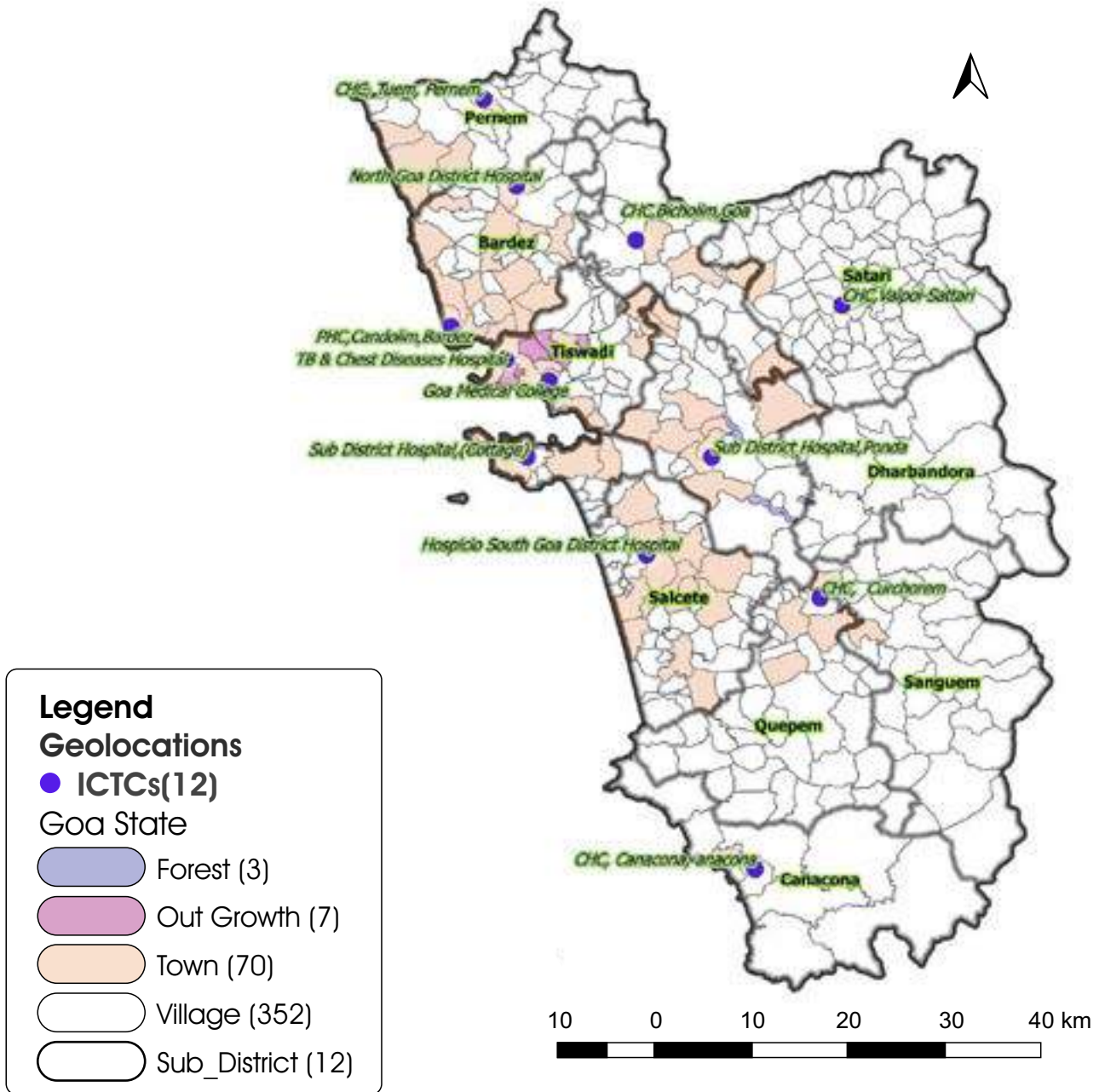


The GIS map of Goa presented above showcases a total of 352 villages, 70 towns, 7 outgrowth areas, and 3 forest areas. Within the North Goa District, the town areas of Bardez and Tiswadi exhibit a higher concentration of population. Outgrowths are specifically observed in the Tiswadi subdivision. On the other hand, rural areas are predominantly found in the Sattari and Pernem subdivisions. In South Goa, the urban localities of Mormugao, Salcette, and Ponda are prominent. Overall, North Goa experiences a higher population density compared to South Goa

SECTION - I

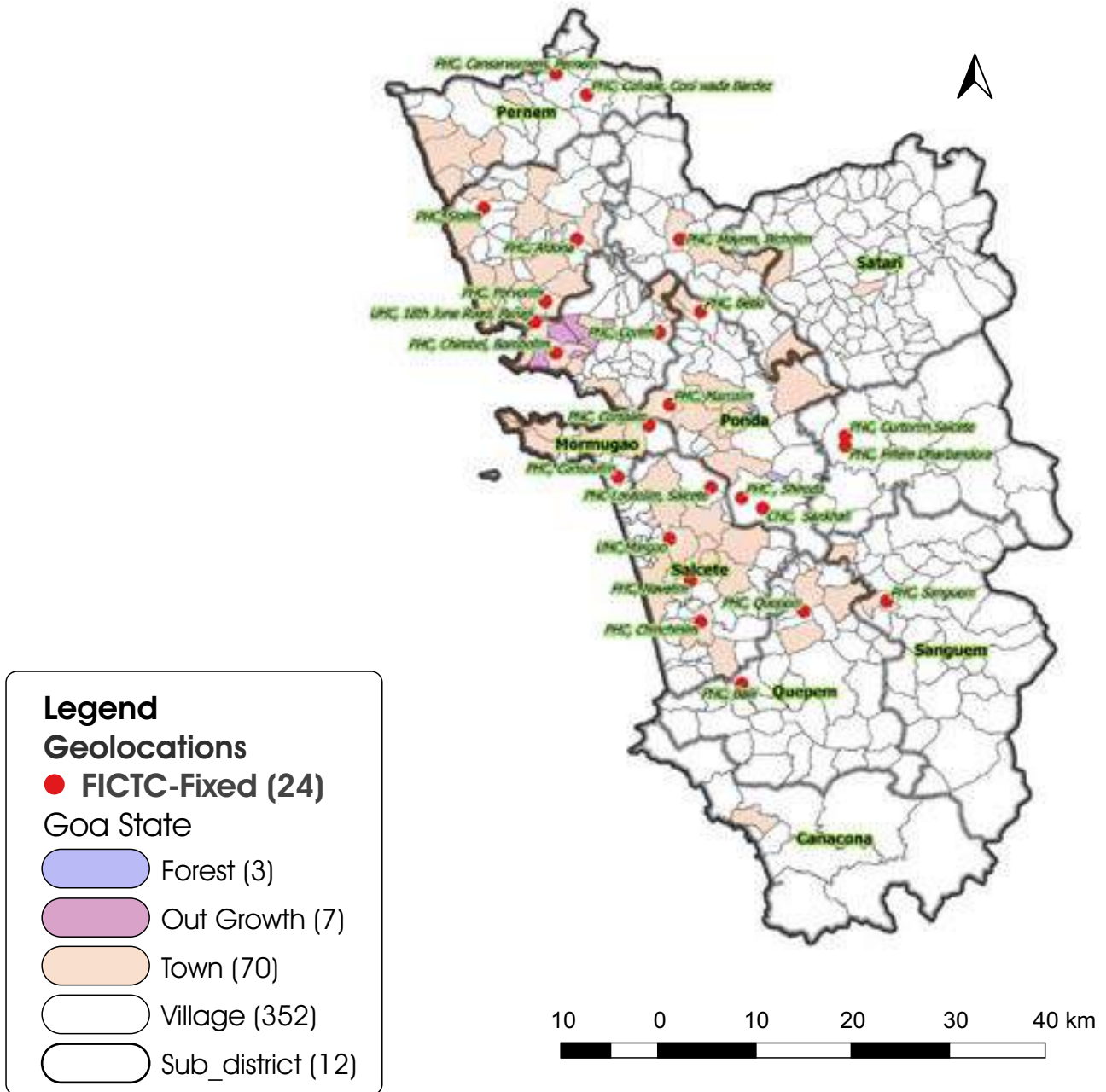
5: Distribution of Infrastructure of Goa SACS Geo-mapping of Distribution and Performance of Public Health Facilities and Spatial analysis of burden of HIV/AIDS at habitat level, of Goa SACS

5.1: Distribution of ICTCs as per Geolocation In the Urban and Rural setting at Subdistrict level, State of Goa.



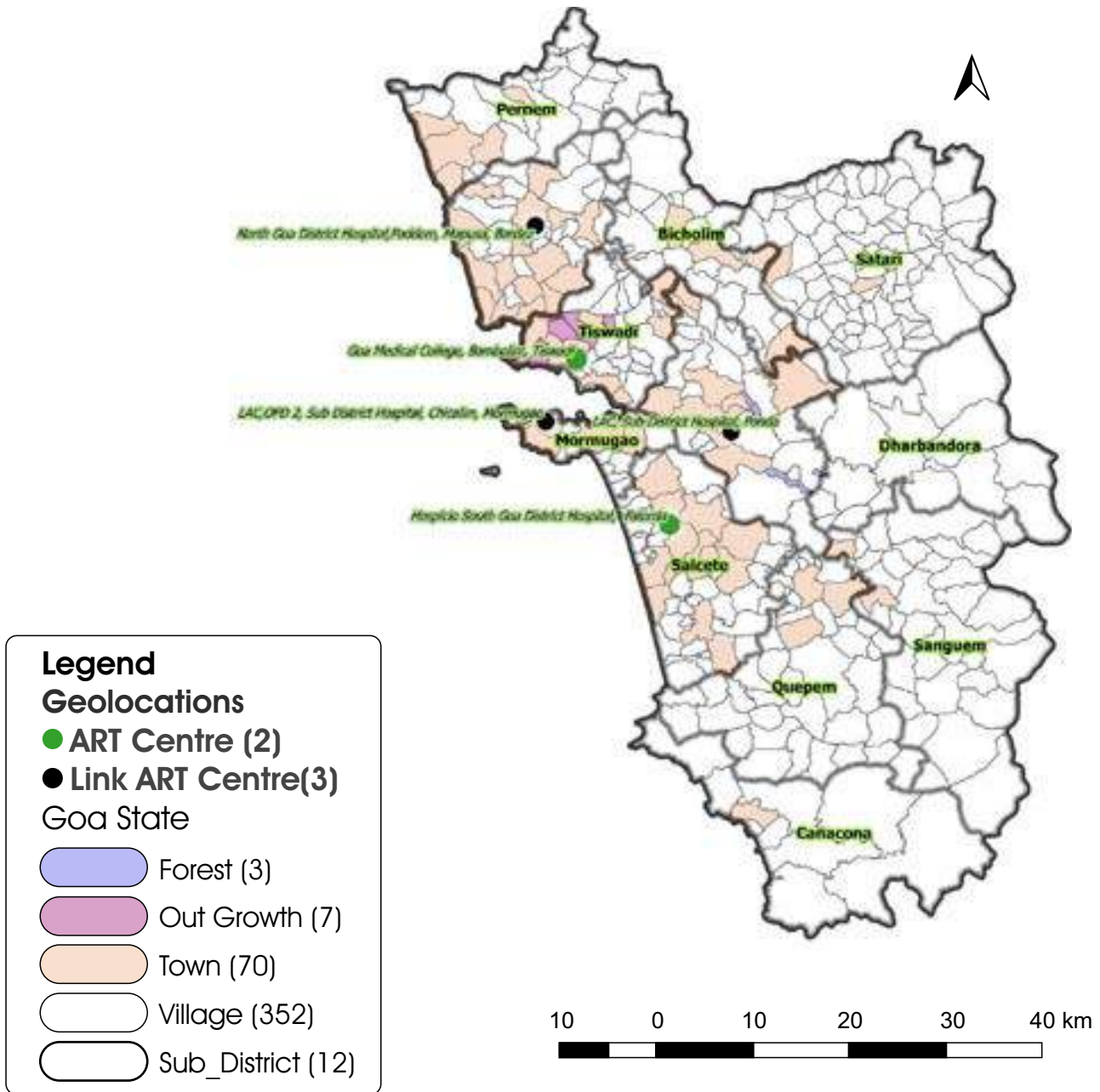
Goa has a total of 12 ICTC centres, primarily located in urban areas. However, Sanguem and Dharbandora, which have a higher proportion of rural residents, stand out as exceptions. Nevertheless, all twelve sub-districts in Goa have at least one ICTC centre. To cater to the urban population, there are two centres available in the Bardez and Tiswadi sub-districts. Furthermore, apart from Quepem, the ICTC centre in CHC Churchorem, Quepem, serves the residents of Sanguem and Dharbandora sub-districts. In terms of geolocation, the facilities of the ICTC centre in Ponda can also benefit the residents of Dharbandora.

5.2 : Distribution of Facility Integrated Counselling and Testing Centres (FICTCs) as per Geolocation In Urban and Rural setting at Subdistrict level, State of Goa



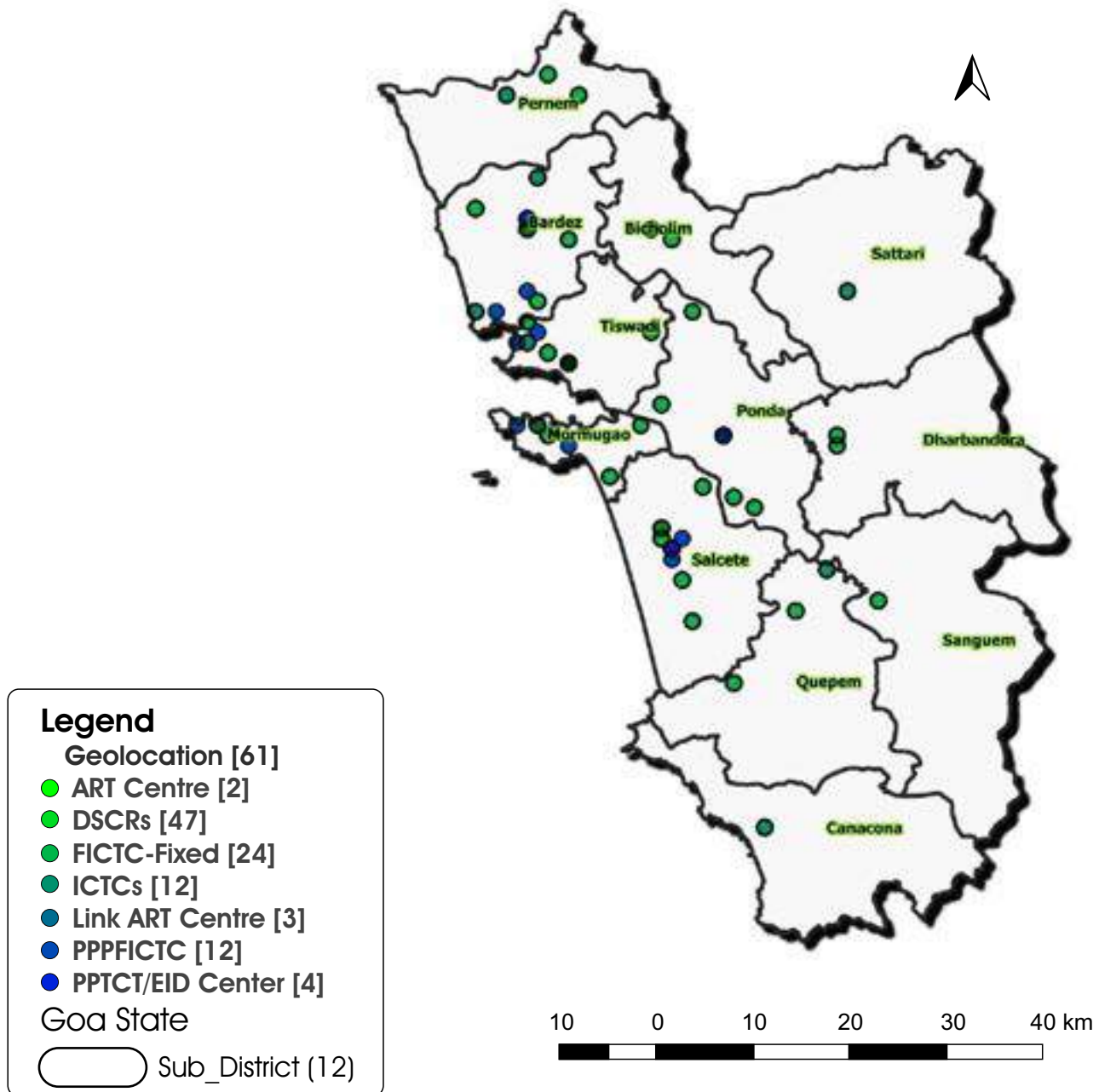
In Goa, there are a total of 24 FICT centres, with a majority of them strategically located along the coastal line to meet the healthcare needs of the urban population. Based on geolocation, the village areas are served by two centres each in Pernem, Salcete, and Ponda, one centre in Quepem, Mormugao, and Bardez. The sections of Bardez, Tiswadi, Ponda, and Salcete each have four centres. It is evident that most of Goa's FICT centres are concentrated in the western and central areas of the state, while the southern and eastern regions are relatively underserved in terms of FICT facilities.

5.3 : Distribution of Anti-Retroviral Therapy (ART) Centre and Link ART Plus Centres (LAC Plus) as per Geolocation In Urban and Rural setting at Subdistrict level, State of Goa



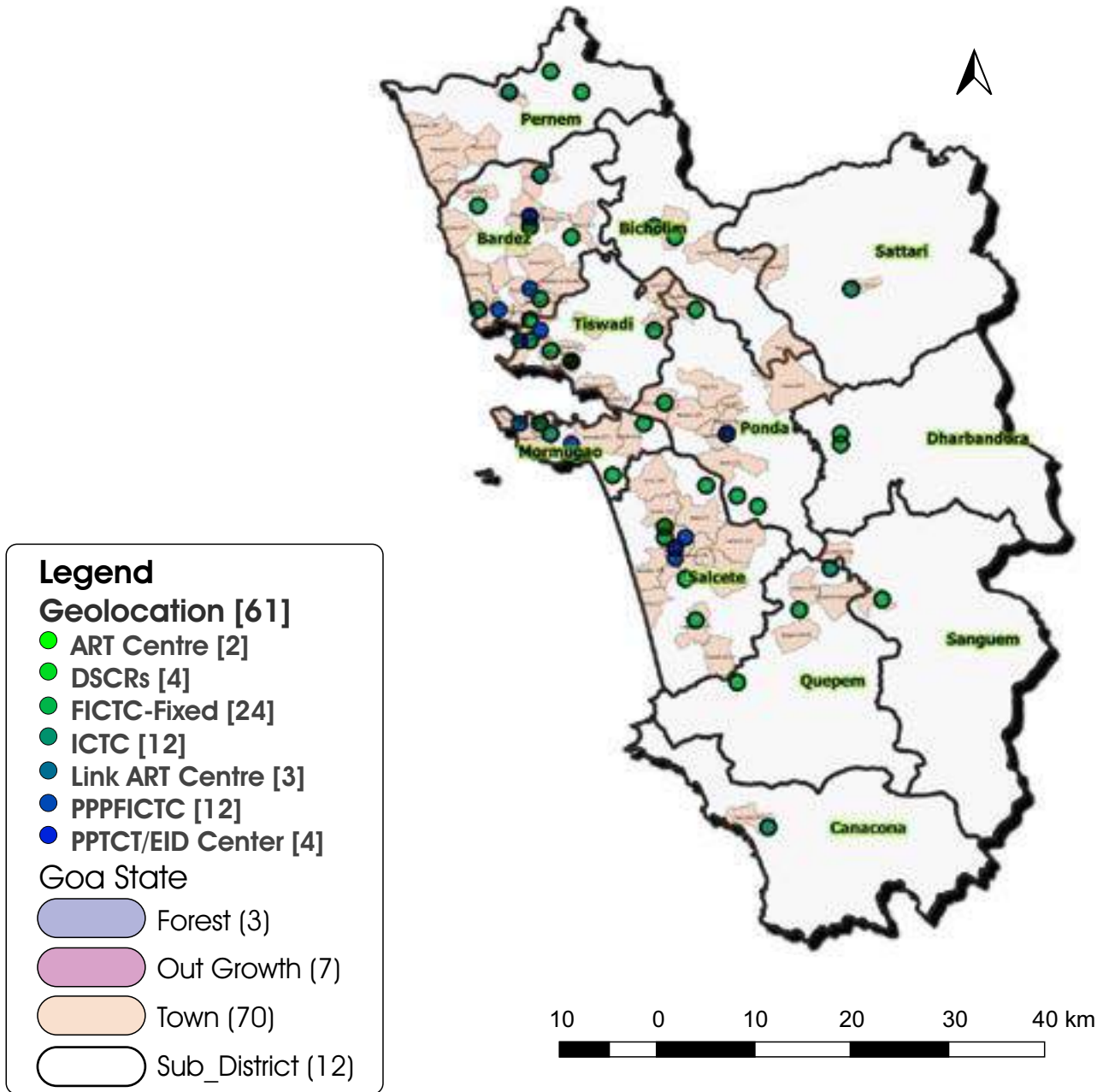
In Goa, there are two ART centres, with one located in each district. The ART centre in North Goa is situated at Goa Medical College in Bambolim, Tiswadi, which falls within an outgrowth area. In South Goa, the ART centre is located at Hospicio, South Goa District Hospital in Fatorda, Salcette. Additionally, there are three Link ART+ centres in Goa. One is situated in Bardez at North Goa District Hospital. The other two centres are located in central Goa, with one in Chicalim within the Mormugao subdistrict at L.A.C., OPD-2, Sub-district Hospital, and another in Ponda at L.A.C. It is worth noting that both the ART centres and Link ART+ centres are situated in urban areas, overlooking the rural population residing in the southern and eastern regions of Goa.

5.4 : Distribution of Surveillance, Testing, Treatment, Counselling, Care support centers in Public and private sectors as per Geolocations (1) in Urban and Rural setting at Subdistrict level, State of Goa



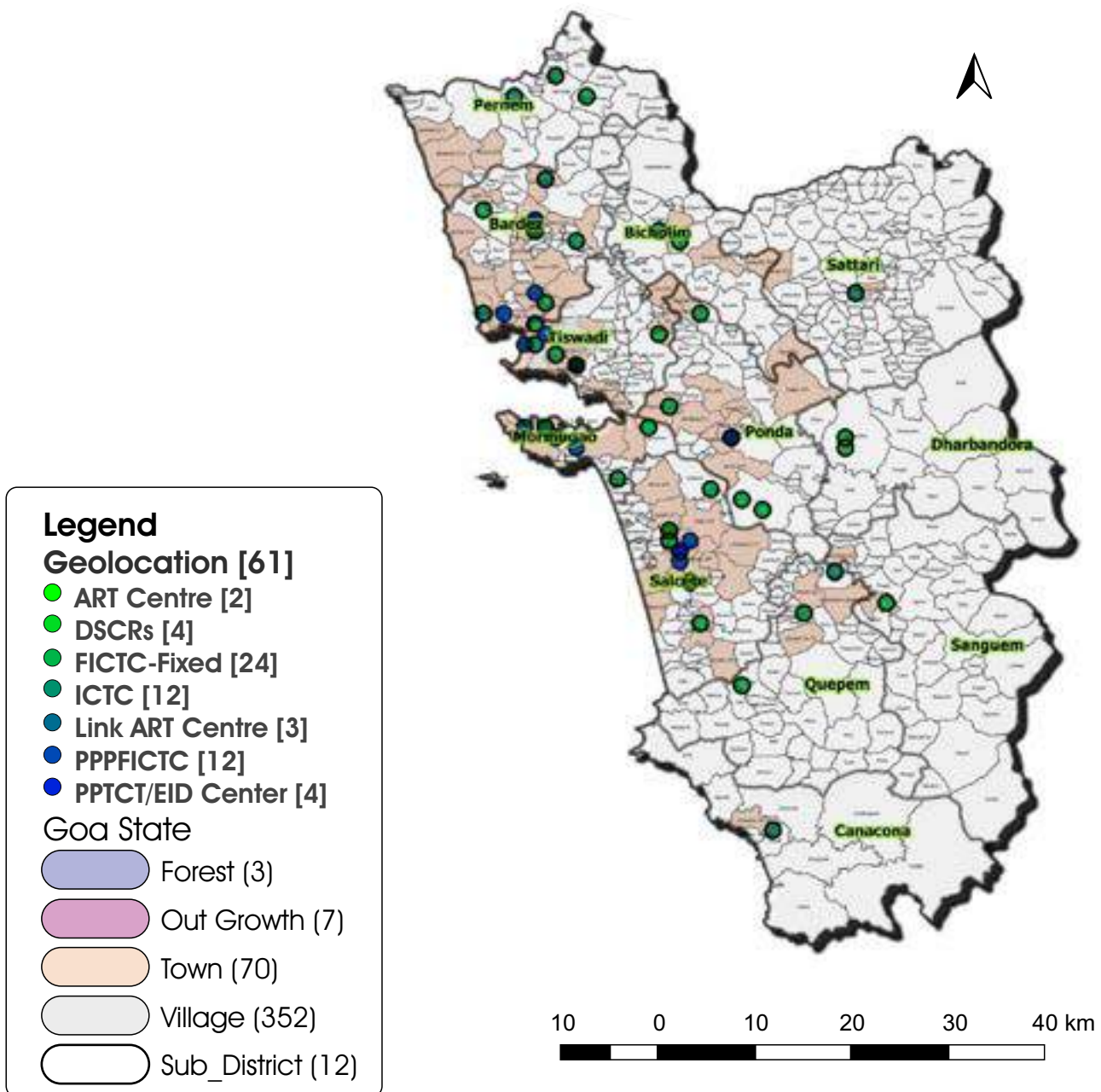
Facilities for HIV/AIDS surveillance, testing, treatment, counselling, and care support are primarily concentrated in the coastal divisions of Bardez, Tiswadi, Mormugao, Ponda, and Salcete subdistricts, where urban populations are predominant. These facilities include ART centers, Link ART centers, DSCRs, FICTCs, and ICTCs. Additionally, there are PPP-FICTC and PPTCT/EID centers scattered across these subdivisions. The provision of services to areas like Canacona, Sanguen, Dharbandora, and Satari is limited to the ICTC and FICT facilities, which are also situated on the western side of these specific subdistricts, overlooking the extreme southern and eastern parts.

5.5: Distribution of Surveillance, Testing, Treatment, Counselling, Care support centers in Public and private sectors as per Geolocations (2) in Urban setting at Subdistrict level, State of Goa



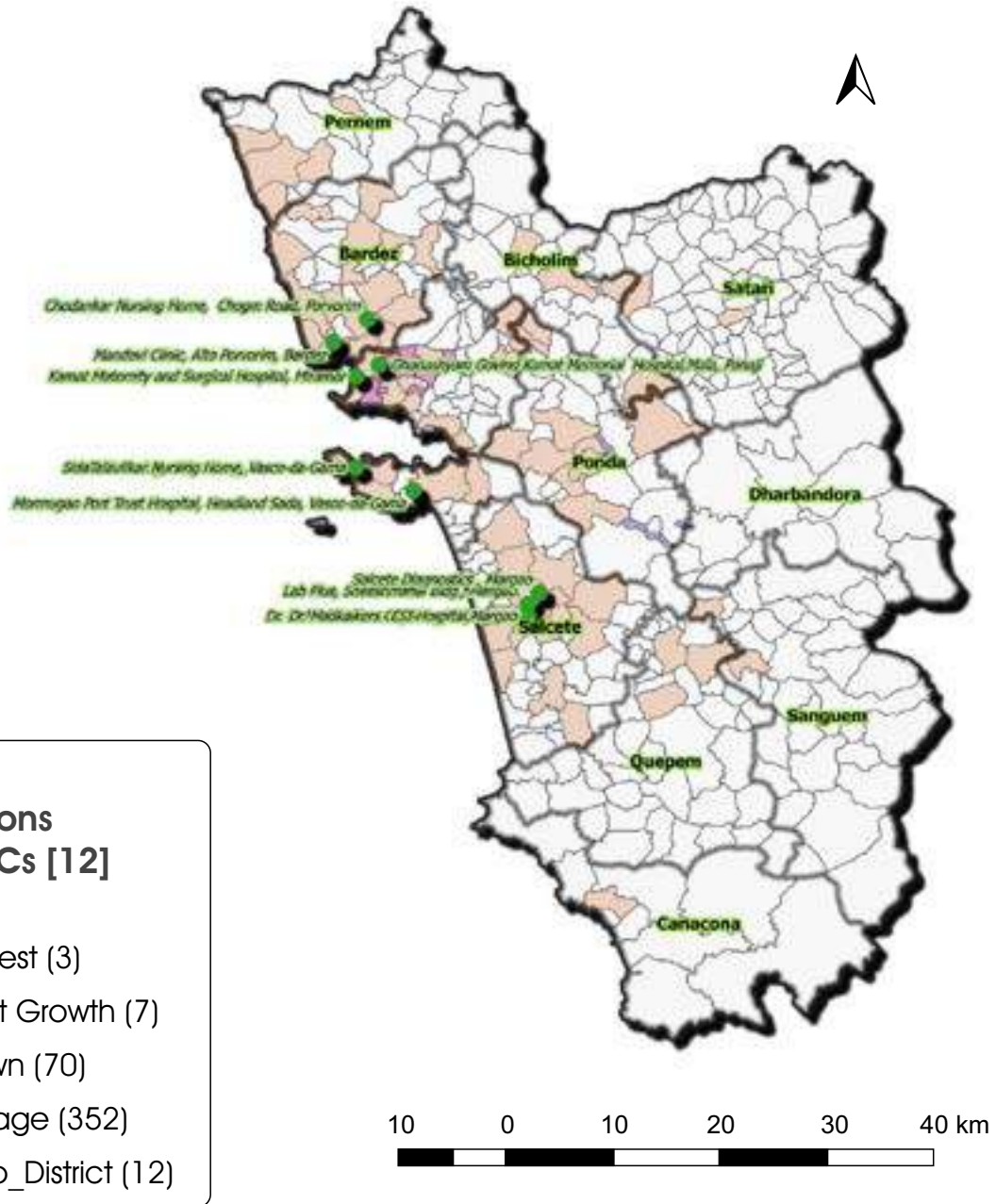
The majority of HIV/AIDS services, including ART centers, DSCR, PPPFICTC, FICTC, ICTC, Link ART centers, and PPTCT/EID centers, are predominantly situated in the subdivisions of Bardez, Tiswadi, Mormugao, Ponda, and Salcette. Among these subdivisions, Bardez has the highest number of ten centers, offering comprehensive services related to HIV/AIDS in Goa. Following Bardez, Salcete and Tiswadi each have seven centers, while Mormugao and Ponda have six and five centers, respectively, providing significant coverage. The concentration of HIV/AIDS services is mainly in the northern and central districts of Goa.

5.6 : Distribution of Surveillance, Testing, Treatment, Counselling, Care support centers in Public and Private sectors as per Geolocations (3) in Urban and Rural setting at Subdistrict level, State of Goa



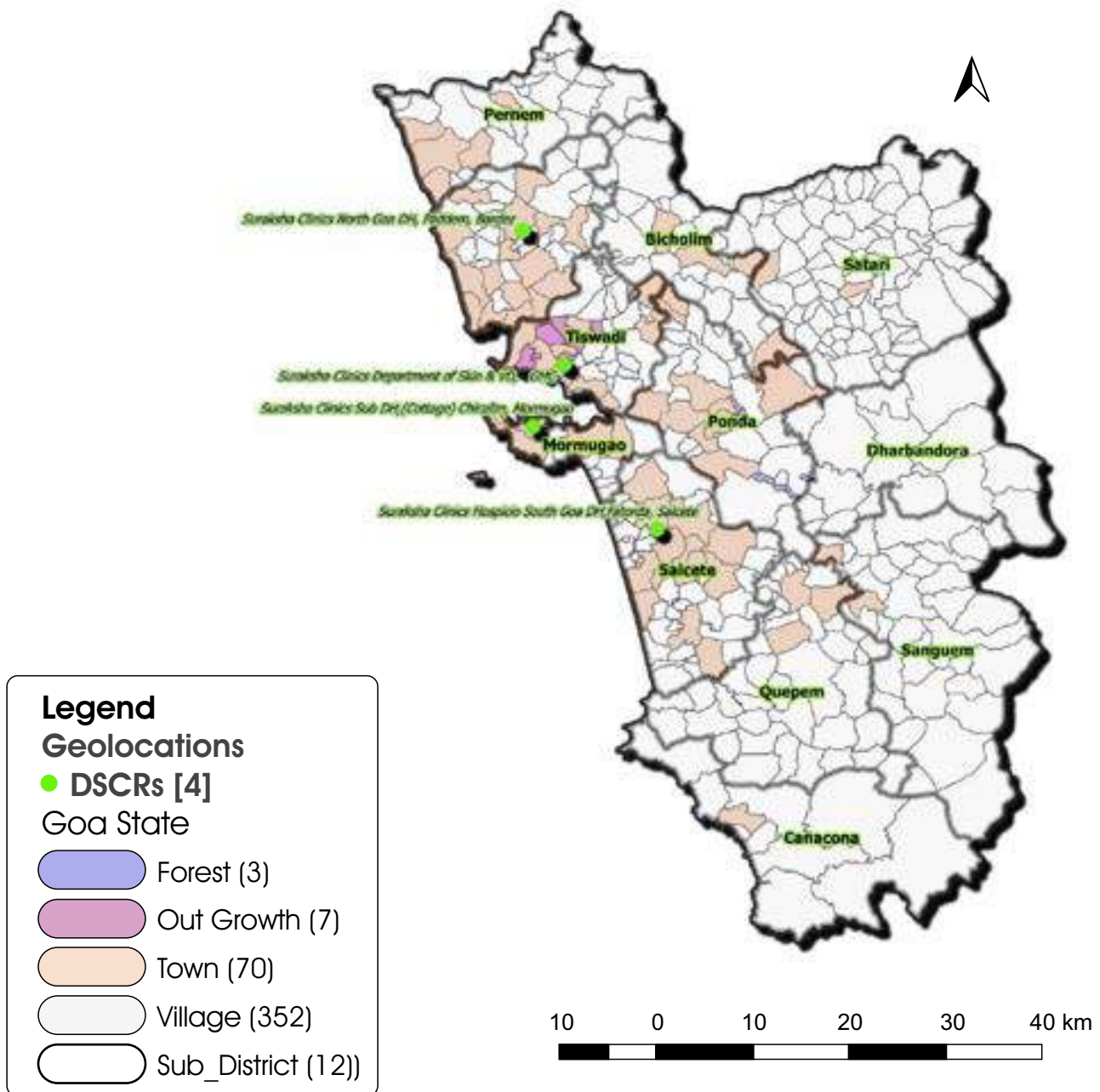
In the Bardez region, eight service centers are situated in town areas, while two are located in rural/village areas. Similarly, in Tiswadi, all seven centers are concentrated in town areas. Mormugao has four centers in town areas and two in rural areas. Among the seven centers in Salcette, one is situated in a village, while the rest are in urban/town areas. Canacona has a single center located in the town area. In Quepem, two centers are located in villages, and one is situated in a peri-urban area. Sanguem has its only center situated in the town area. Lastly, in Dharbandora, two centers are located in rural areas. From this data, it is evident that the majority of HIV/AIDS service centers are located in urban areas.

5.7 : Distribution of facility integrated counselling and testing centres under public private partnership (PPP-FICTCs) as per geolocation in urban and rural setting at subdistrict level in the state of Goa



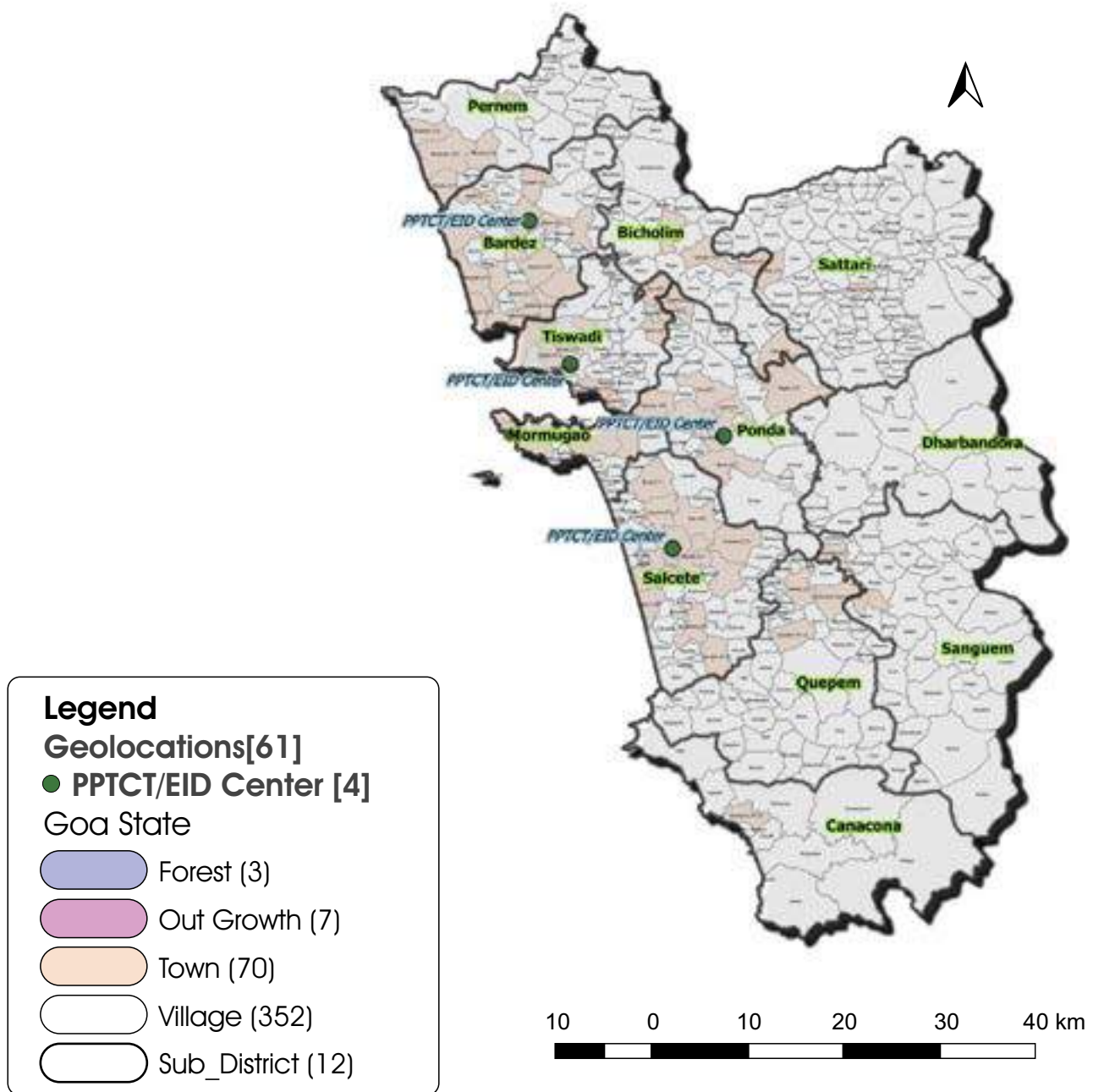
In Goa, there are a total of twelve PPP-FICTC. Bardez subdistrict houses two centers in town areas, while Tiswadi has two centers in outgrowth areas. In Mormugao, two centers are located in urban/town areas, and in Salcette, three centers are situated in urban areas. It is evident that a significant number of these centers are concentrated along the coastal regions, where a higher dispersal of PLHIV patients is observed.

5.8 : Distribution of STD clinic "Suraksha clinics" as per Geolocations in Urban and Rural settings in the state of Goa



In the state of Goa, there are four "Suraksha clinics" distributed across different areas. One is located in Salcete, another in Tiswadi, one in Bardez, and the last one in Mormugao. The Suraksha clinic in Bardez operates at the North Goa DH Paddem, while the one in Tiswadi is in service at GMC's Skin and VD Department. In Salcete, the clinic is situated at Hospicio in the south Goa DH, Fatorda, and in Mormugao, it is located at Sub-DH (cottage) Chicalim. Geographically, all four Suraksha clinics are situated in urban settings along the coastal areas. However, there is currently no Suraksha clinic catering specifically to the rural population in the southern or western regions of Goa

5.9 : Distribution of PPTCT / EID Centres as per Geolocations in Urban and Rural setting at Subdistrict level in the state of Goa

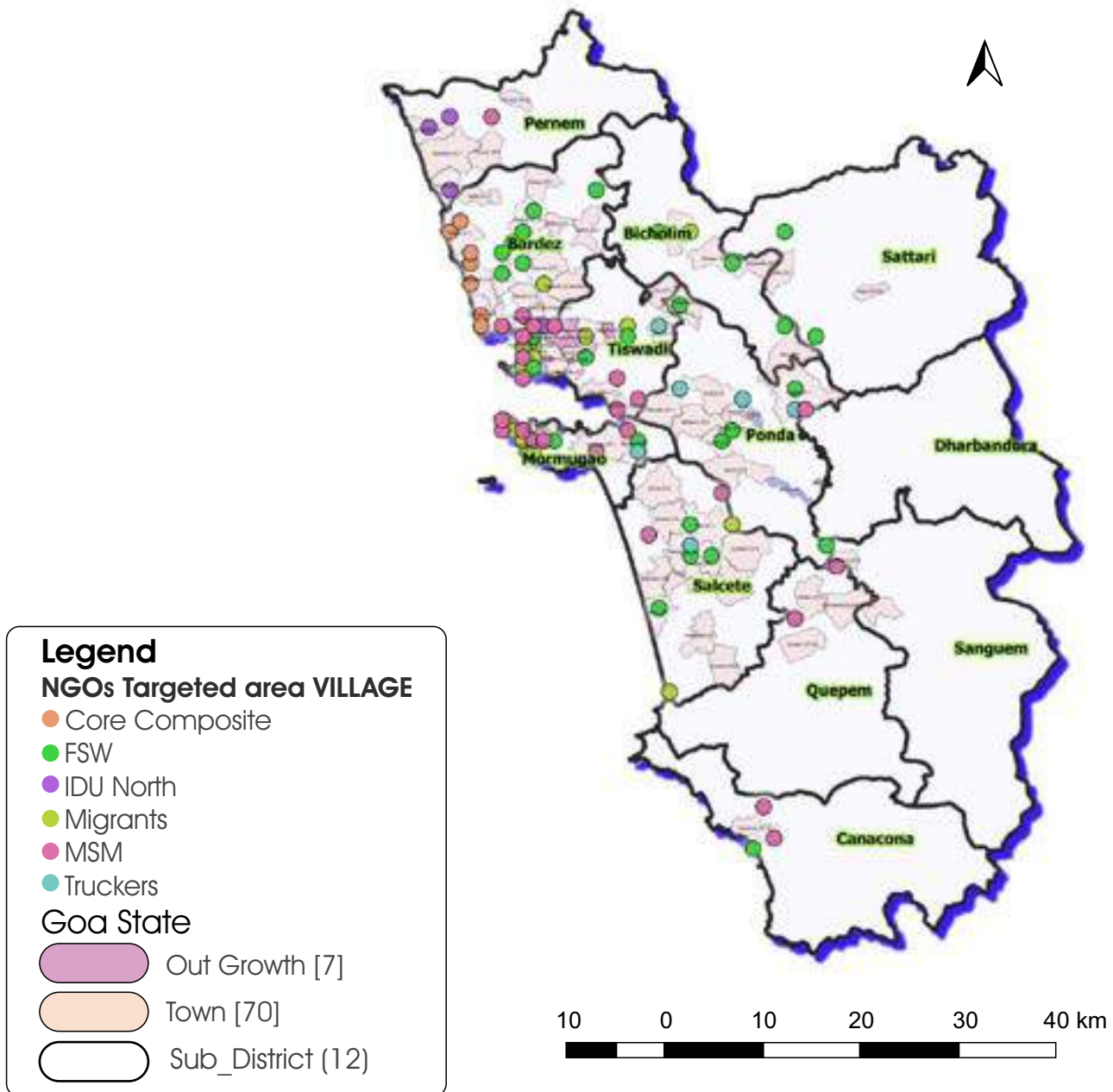


In Goa, there are a total of four Prevention of Parent to Child Transmission (PPTCT)/Early Infant Diagnosis (EID) centers. These centers are located in Tiswadi, Ponda, Salcete, and Bardez. It is worth noting that all of these centers are situated in urban/town regions.

6 : Mapping of NGOs and area of Targeted Intervention

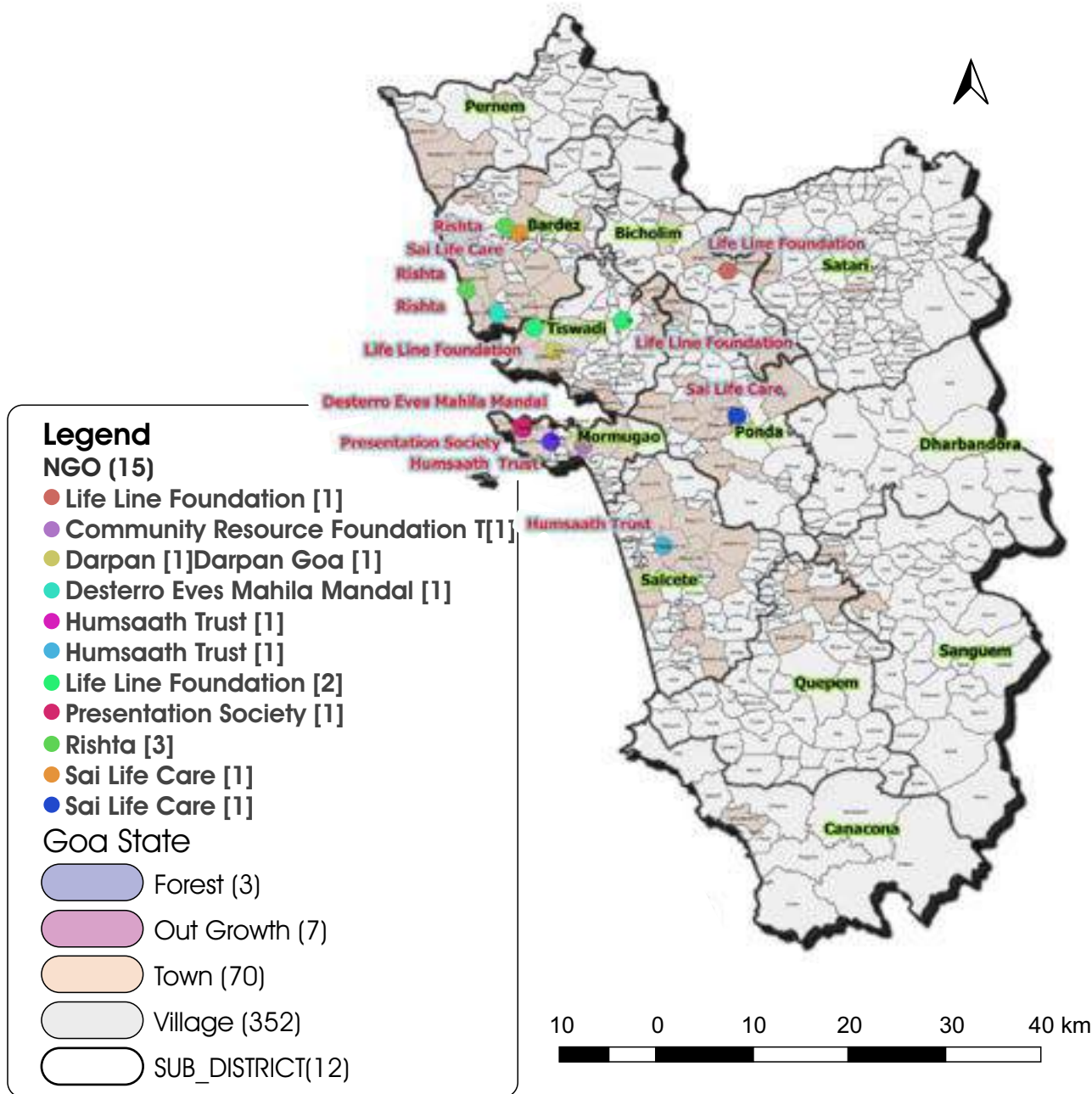
**Geo-mapping of Distribution and Performance of Public Health
Facilities and Spatial analysis of burden of HIV/AIDS at habitat level,
of Goa SACS**

6.1: Distribution of target groups as per NGOs areas per Geolocation in Urban setting at Subdistrict level, state of Goa



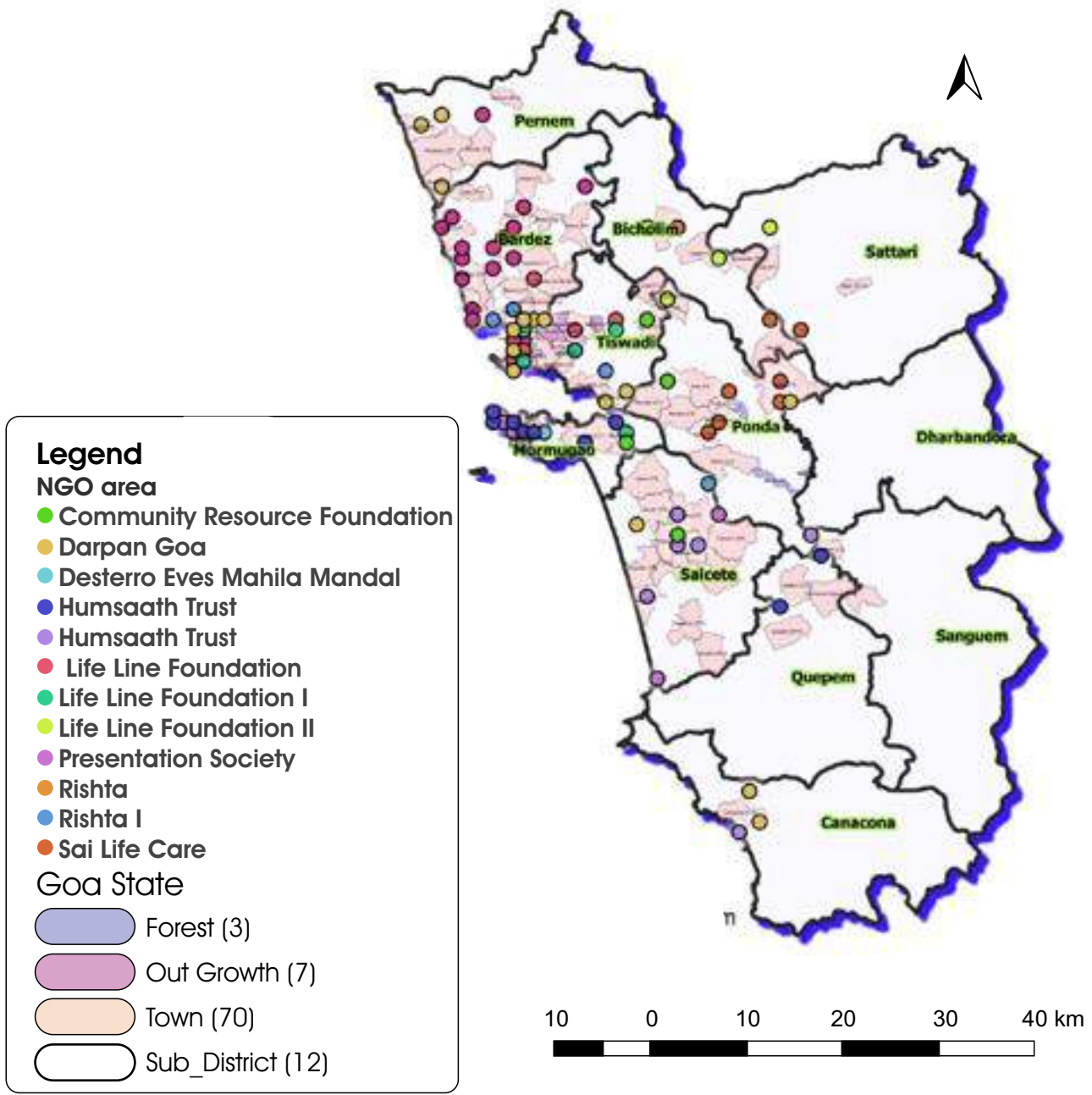
In the Pernem subdistrict, NGOs primarily focus on the IDU population residing in coastal areas near Arambol and Morgan. Additionally, one NGO caters to the MSM population in rural areas. Within the Bardez subdistrict, NGOs cover a diverse range of populations, including core composite groups, FSW, MSM, and migrants. This coverage is particularly extensive in the southern coastal belt. In the Tiswadi subdistrict, the targeted groups for NGOs include MSM, migrants, FSW, and a portion of the IDU population along the coastal stretch between Renovadi and Bambolim. Within Cortalim, the trucker population is the main focus for NGOs. Goa Velha and Merlin specifically concentrate on the MSM population. In Ponda, NGOs primarily target the FSW population, with the MSM population also observed in Usgaon, along the border. Quepem has two areas of focus for the rural MSM population. Canacona city covers both the MSM and FSW populations, while Sanguem and Sattari subdistricts focus primarily on the FSW and MSM populations, respectively. In Bicholim, NGOs target both the FSW and migrant populations, and there are specific areas in Carapur and Pali that are targeted for FSW populations.

6.2 : Distribution of NGO for Targeted Interventions, Goa SACS



Goa has a total of 15 NGOs dedicated to targeted interventions. The majority of these NGOs are situated in the sub-districts of Bardez, Tiswadi, and Mormugao. In Bicholim, Ponda, and Salcette, there is one functioning NGO in each respective area. There is a noticeable absence of NGOs in the extreme northern, southern, and eastern regions of Goa. Subdivisions such as Pernem, Sattari, Dharbandora, Quepem, Sanguem, and Canacona currently do not have any operating NGOs. Consequently, the distribution of NGO is skewed towards the central and northern coastal belts of Goa.

6.3 : Distribution of NGOs as per Geolocation in Urban Setting at Sub district level in Goa

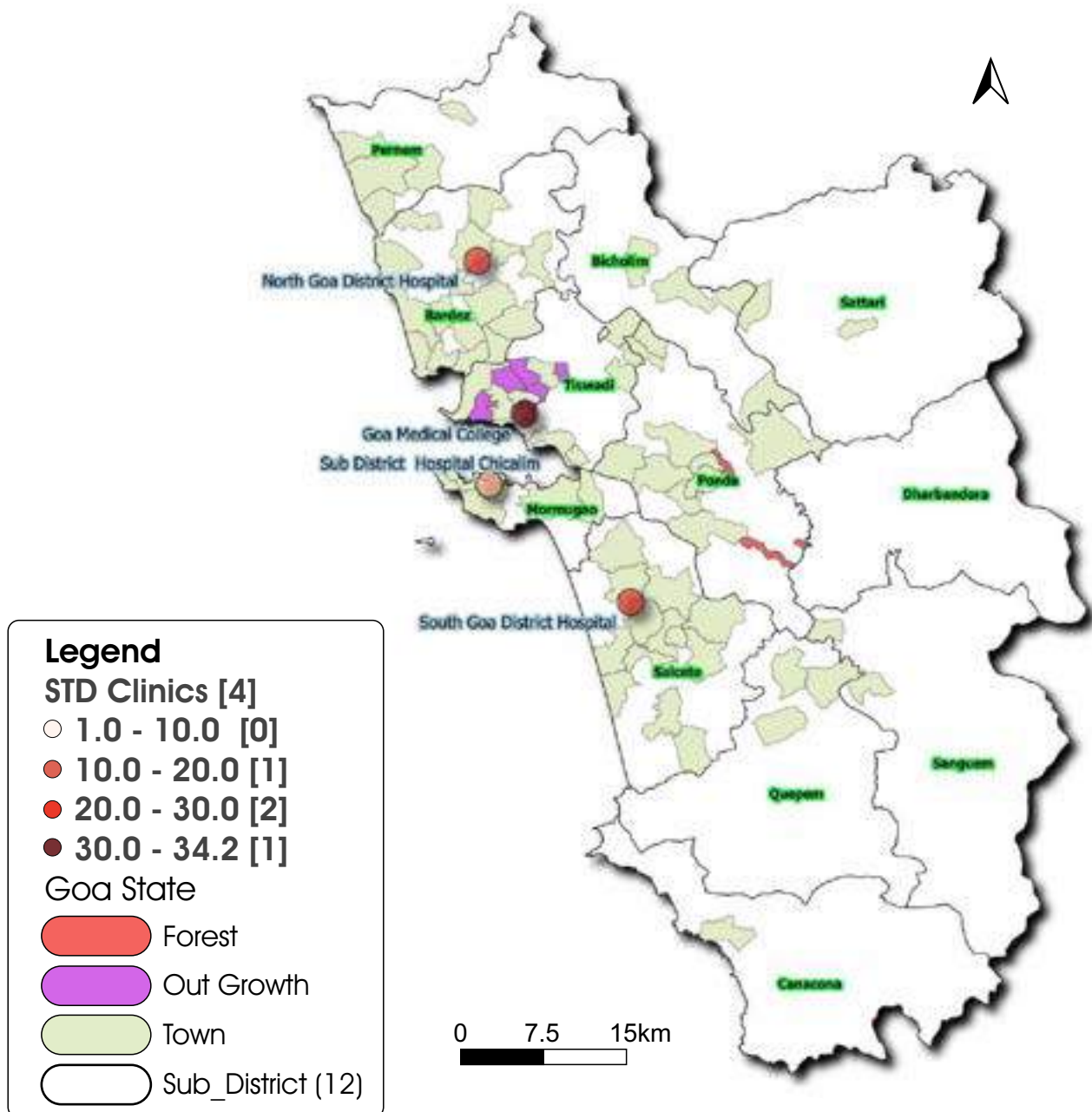


The Pernem region in North Goa District has four NGOs, with one located in a rural area. In Bardez, one NGO operates in the Townside, while the others are situated in urban areas. Four NGOs provide services in rural areas of Tiswadi. In Ponda, one NGO is located in the peri-urban area, while the remaining NGOs are situated in urban areas. In Bicholim, there are two NGOs in villages and two in towns. Sattari has two NGOs operating in rural areas. Mormugao in South Goa District has one NGO in the peri-urban area and the rest in urban areas. In Salcette, two NGOs are located in rural and peri-urban areas, respectively, while the others are situated in towns. In Quepem, one NGO operates in the village, and another is situated in the peri-urban area. Two NGOs are located in the peri-urban area of Canacona. There are no NGOs providing services in Sanguem or Dharbandora. It is notable that the majority of NGOs are concentrated along the coastal regions of Bardez, Tiswadi, and Mormugao, compared to the southern and eastern regions, which have a higher proportion of targeted populations.

SECTION - II

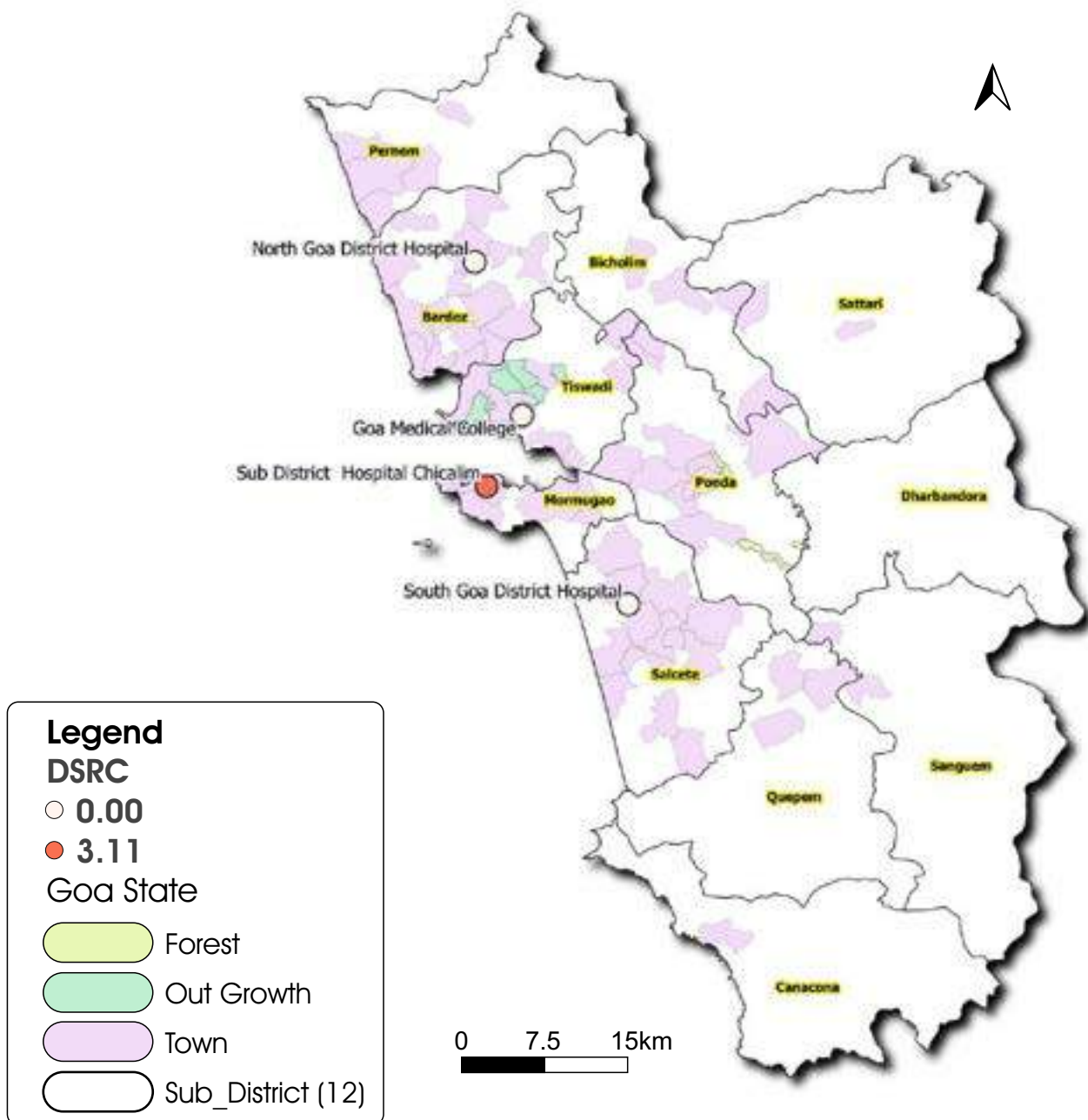
7 : Programmatic indicators Maps Geo-mapping of Distribution and Performance of Public Health Facilities and Spatial analysis of burden of HIV/AIDS at habitat level, of Goa SACS

7.1 : Proportion of persons diagnosed with an STI/RTI at Designated STI /RTI clinics(DSRC), State of Goa



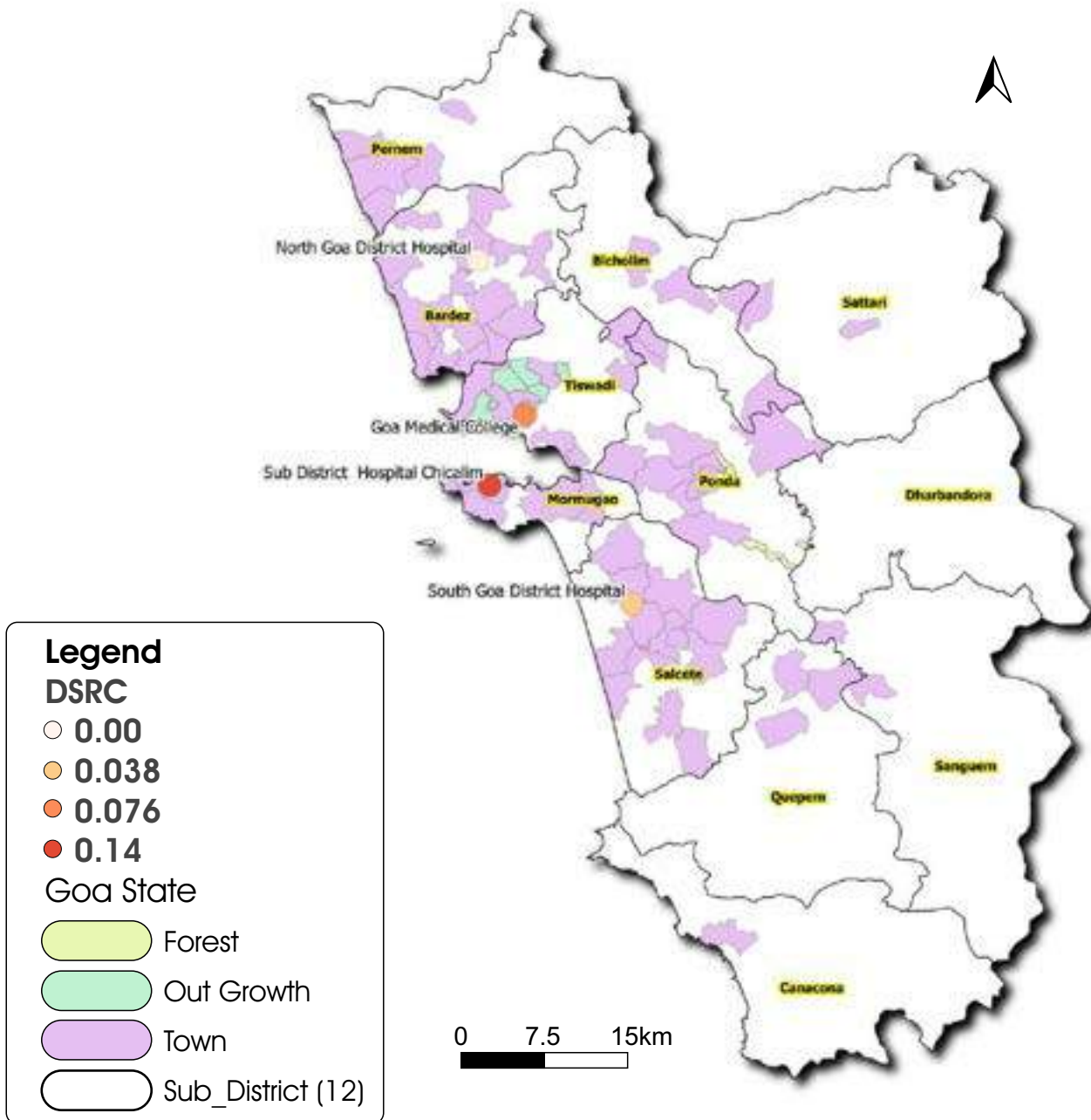
Goa has a total of four STD clinics. Three of these clinics are located in the town areas of Bardez, Salcette, and Mormugao. The fourth clinic, catering to the Tiswadi subdistrict, is situated in a village that adjoins the town area. In Bardez and Salcette, the proportion of individuals diagnosed with sexually transmitted infections (STIs) or reproductive tract infections (RTIs) is relatively high, ranging between 20 and 30 percent. However, in Tiswadi, this rate is exceptionally high, ranging between 30 and 34.2 percent. In Mormugao, the percentage ranges from 10 to 20 percent, placing it in the middle range in comparison to the other subdistricts.

7.2 : HIV positivity (%) among STI attendees at DSRC, State of Goa



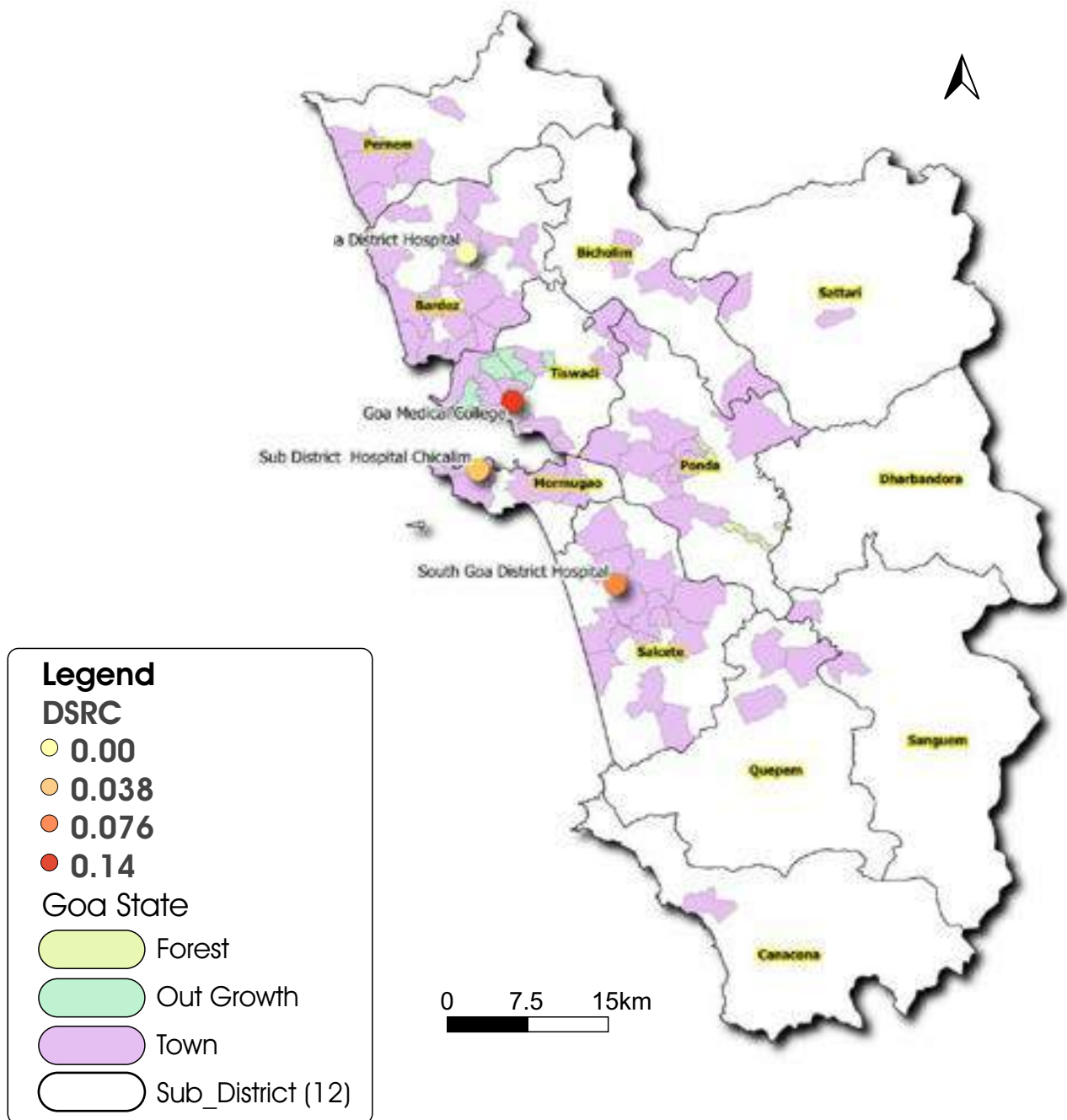
HIV positivity percentage among STI attendees at DSRC in Goa is nil in Bardez, Tiswadi, and Salcette. However, an HIV positivity percentage of 3.11% among STI attendees was observed in Mormugao at Chicalim Sub-district Hospital.

7.3 : Stratification of DSRC as per percentage Sero Positive for Syphilis(%) among ANC mothers



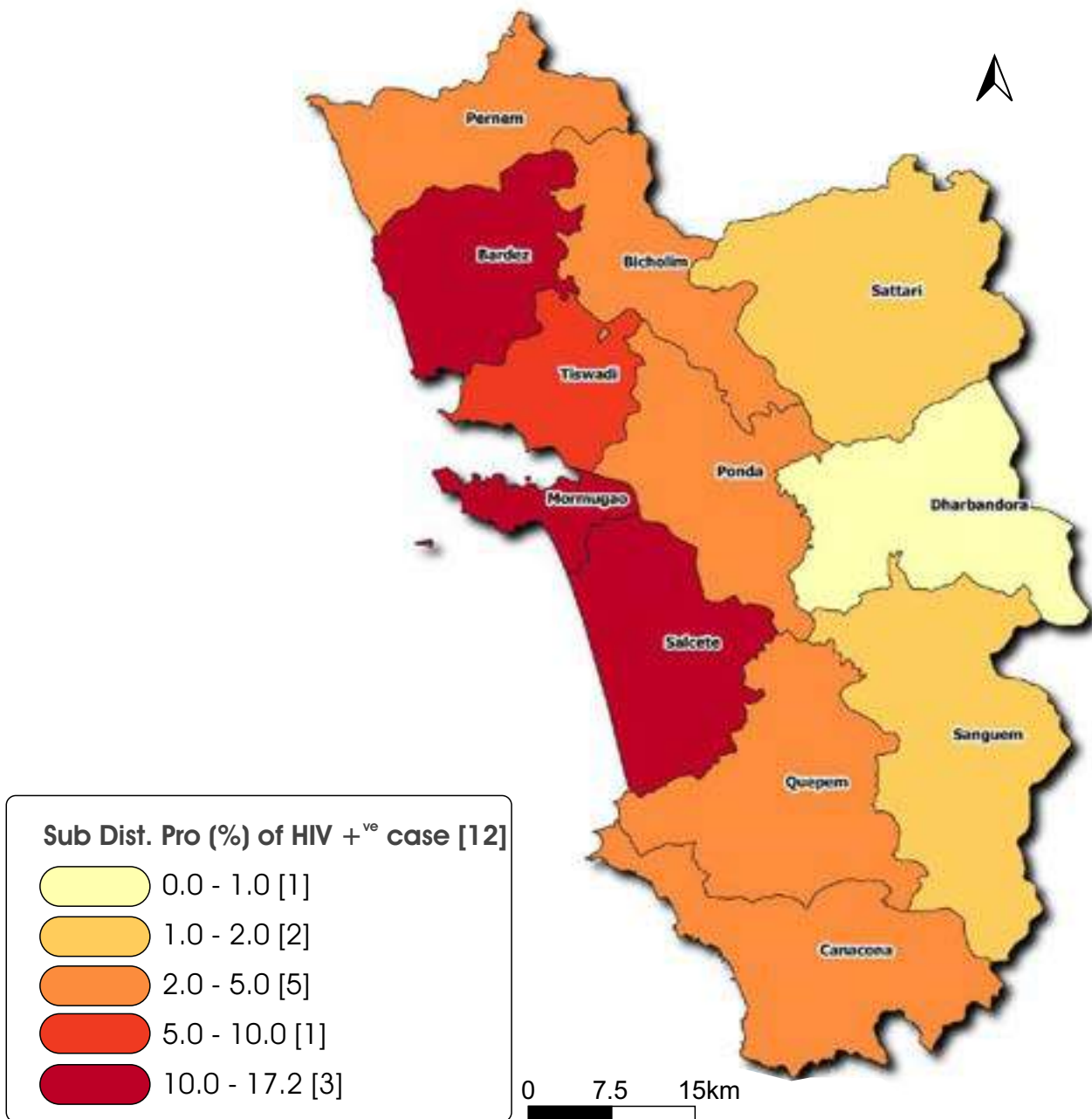
The seropositive rate for syphilis among ANC mothers varies between 0-0.14 at DSRCs in Goa. In Bardez, the percentage is zero. In Tiswadi, Mormugao, and Salcete, it is 0.076, 0.14, and 0.038, respectively.

7.4 : Percentage Sero positivity of Syphilis among STI attendees at DSRC, State of Goa



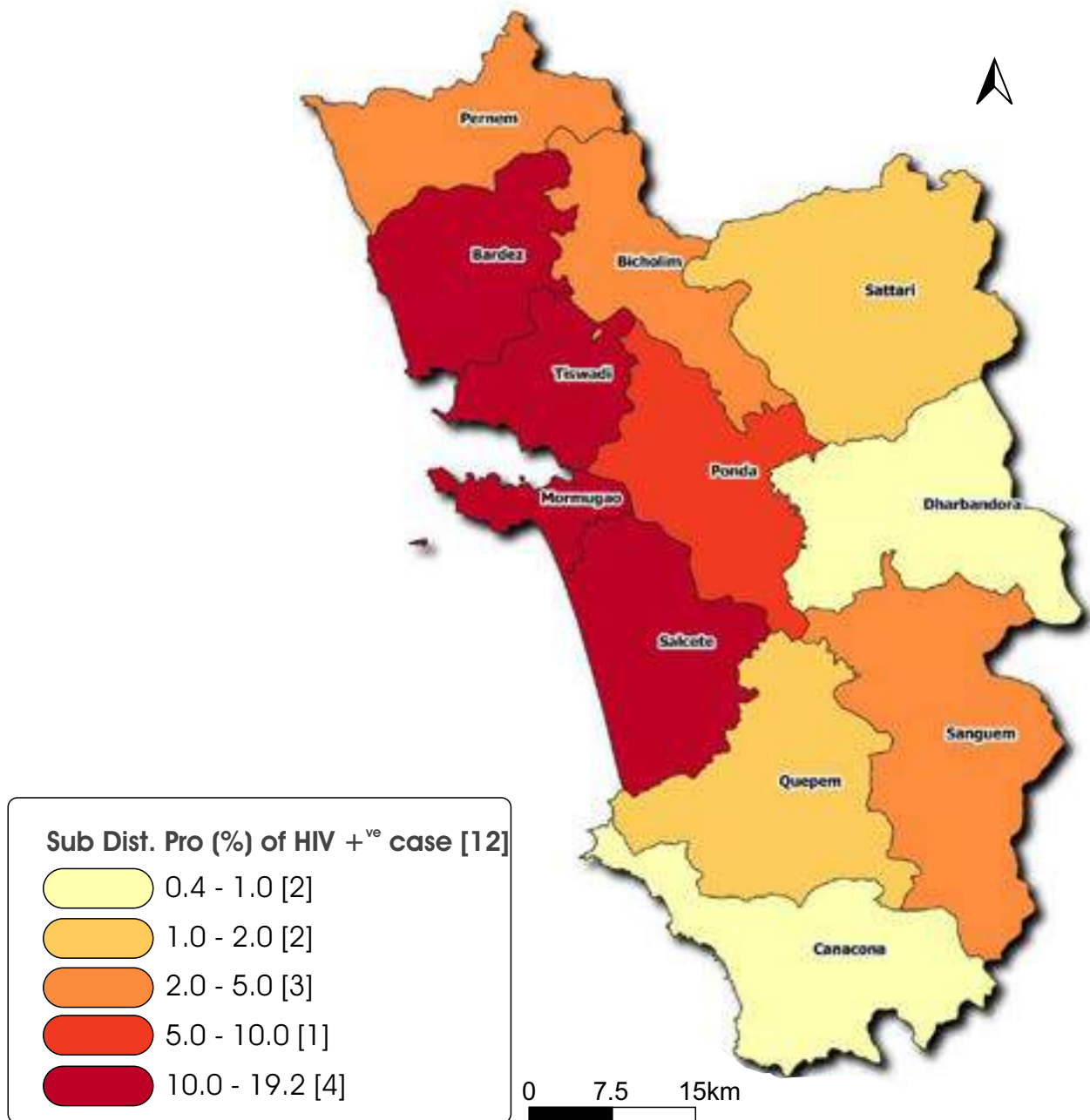
The seropositive rate of syphilis among STI attendees is zero in Bardez. In Mormugao and Salcette, the positivity rate of syphilis among STI attendees is 0.038 and 0.076, respectively. However, in the Tiswadi subdivision of North Goa, it is 0.14, which is the highest in Goa.

7.5 : Stratification of subdistrict as per Proportion of HIV positive cases detected during year 2020, State of Goa



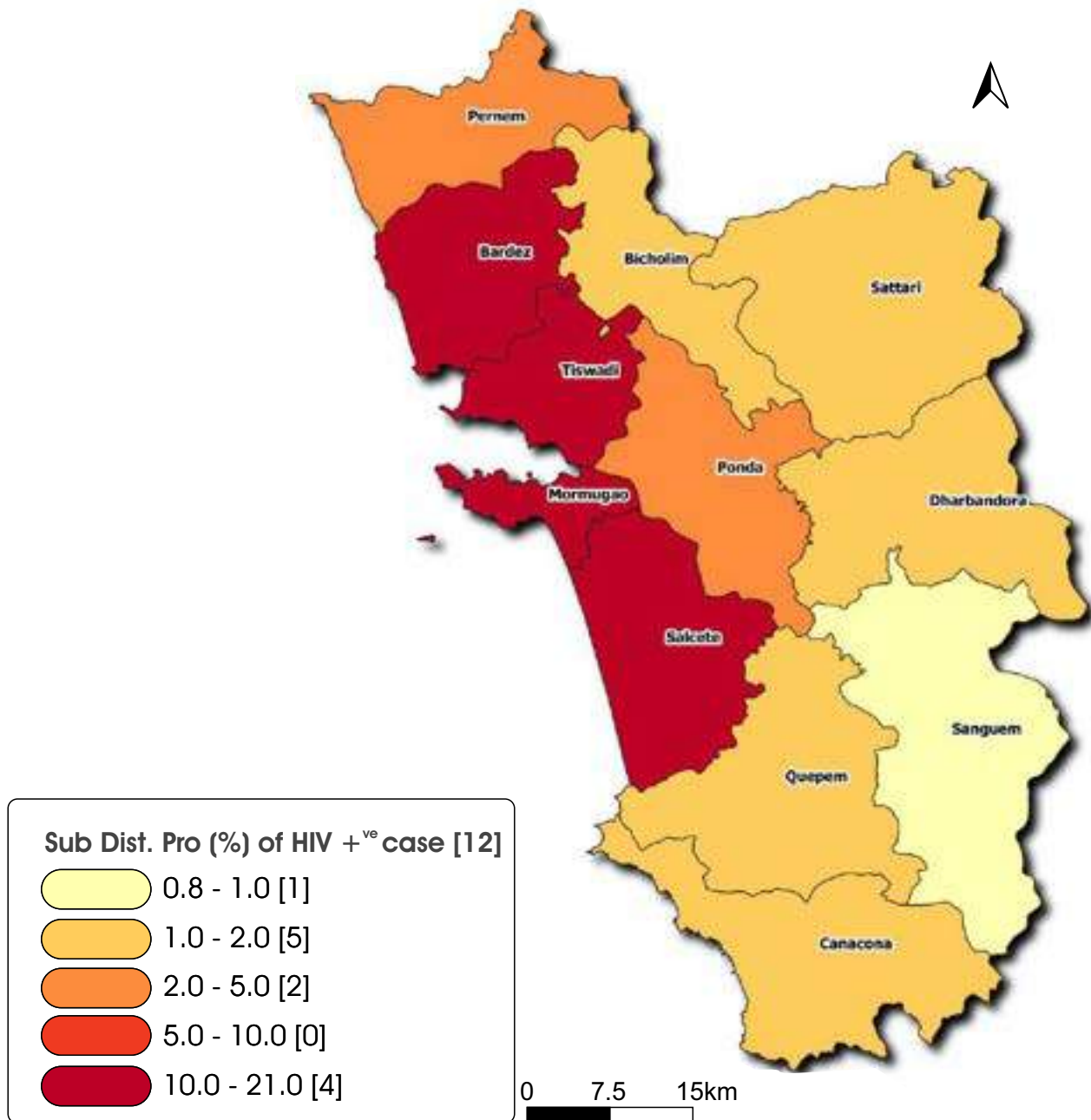
The percentage of HIV-positive cases varies significantly across different sub-districts of Goa. In the Bardez Sub-district of North Goa and the Mormugao and Salcete Sub-districts of South Goa, the proportion is very high, ranging between 10 and 17.2%. Tiswadi Sub-district has a relatively high rate, ranging between 5 and 10%. In sub-districts such as Pernem, Bicholim, Ponda, Quepem, and Canacona, the percentage is considered medium, ranging from 2 to 5%. However, in Sattari Sub-district, the percentage is relatively low, ranging between 1 and 2%. It is worth noting that HIV-positive cases are extremely rare in the South Goa sub-districts of Dharbandora and Sanguem. It becomes evident that the percentage of HIV positivity tends to decrease from the western region of Goa towards the eastern region.

7.6 : Stratification of subdistrict as per Proportion of HIV positive cases detected during year 2021, State of Goa



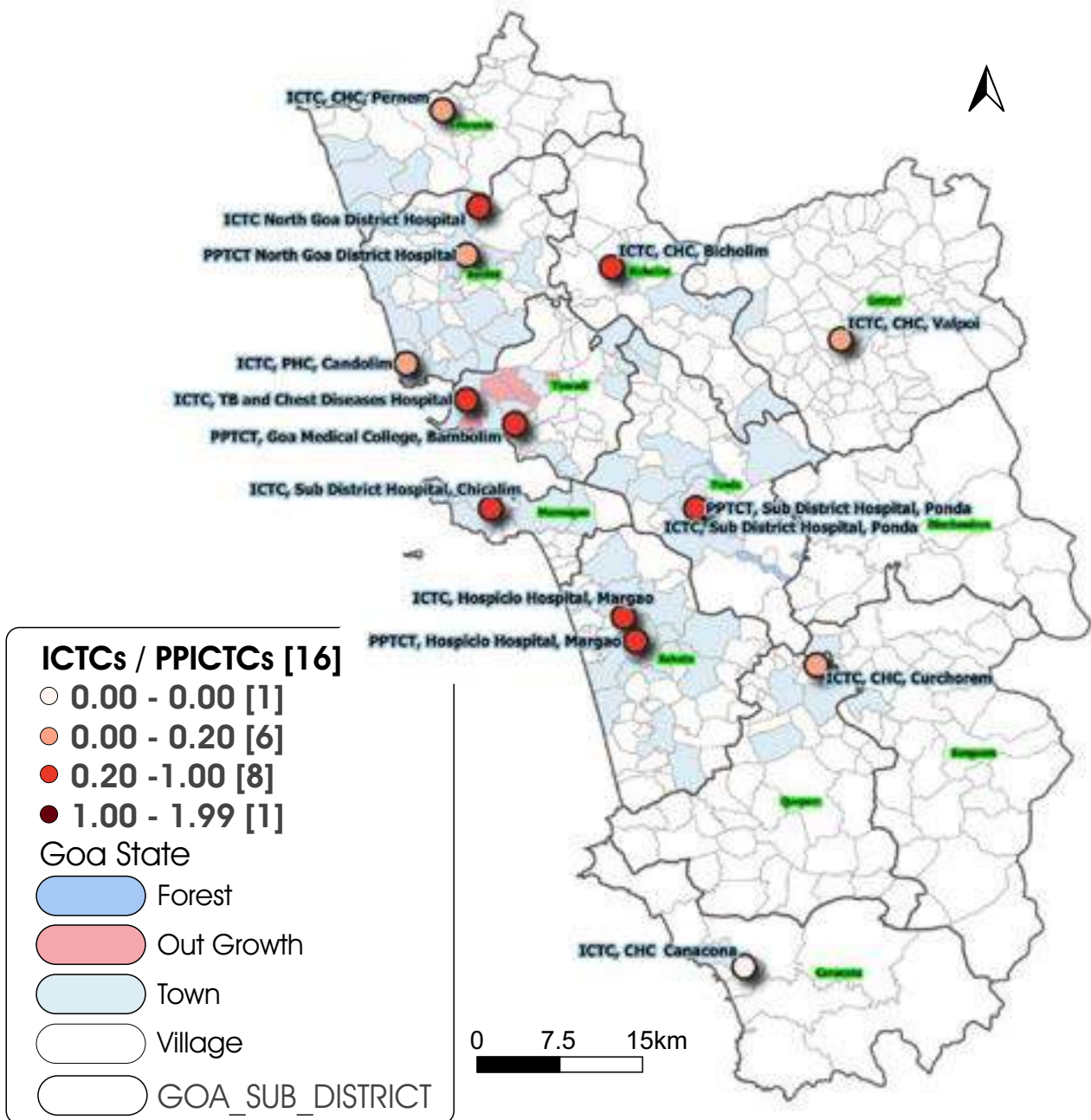
In Goa, as of 2021, the percentage of HIV-positive cases is notably high in the Bardez, Tiswadi, Mormugao, and Salcete subdistricts. These areas experience a significant burden of HIV cases. In the Ponda Sub-district of South Goa, the percentage of HIV-positive cases is also relatively high, ranging between 5 and 10%. Moving to the medium percentage category, we have the Pernem, Bicholim, and Sanguem sub-districts in Goa. Pernem and Bicholim are located in North Goa, while Sanguem is situated in South Goa. In the Sattari and Quepem sub-districts, the percentage of HIV-positive cases is comparatively lower, ranging between 1% and 2%. Among all the sub-districts in Goa, Dharbandora and Canacona have a remarkably low percentage of HIV-positive cases. These variations in percentage demonstrate the differing burden of HIV across the sub-districts in Goa.

7.7 : Stratification of subdistrict as per Proportion of HIV positive cases detected during year 2022, State of Goa



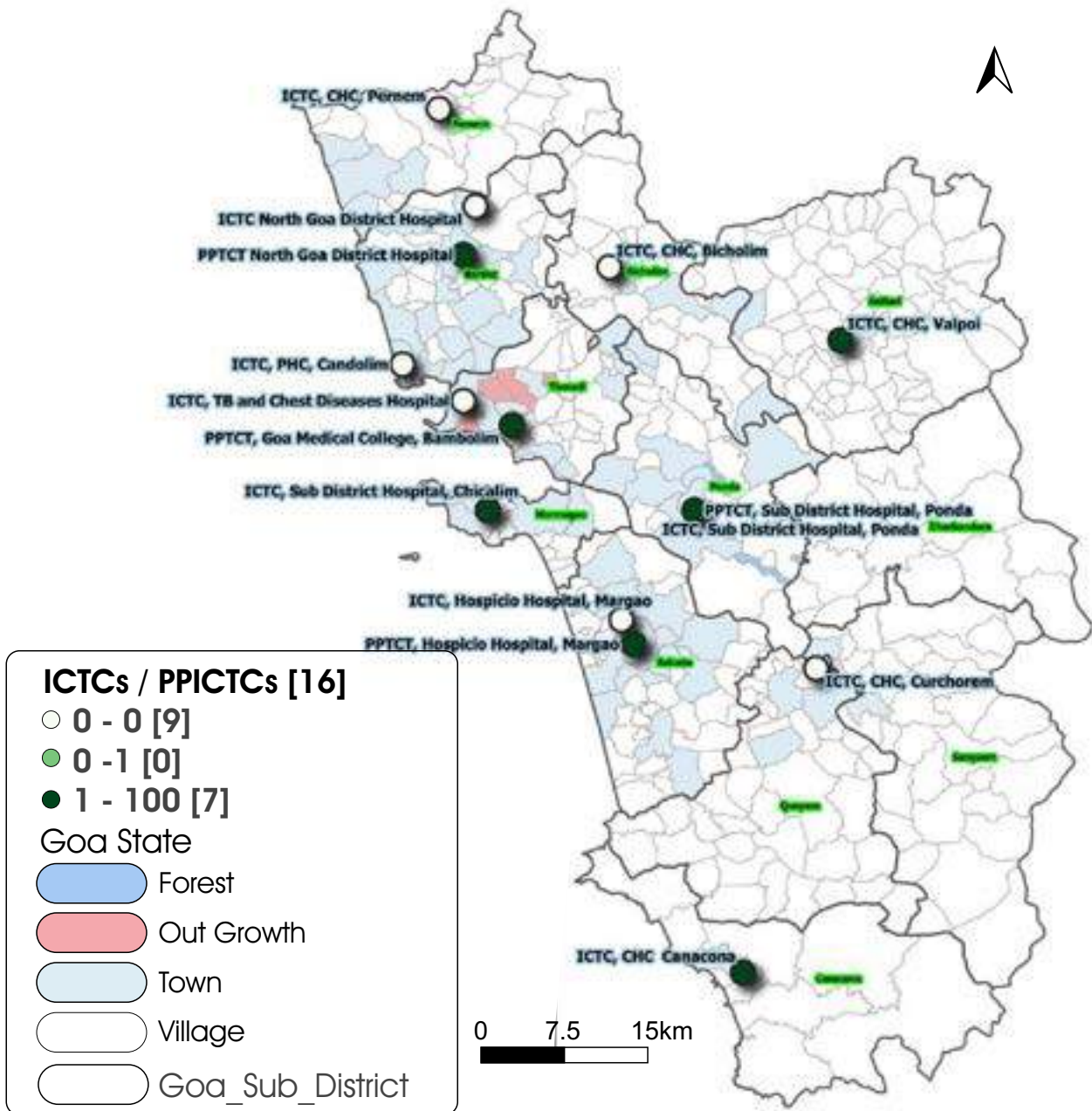
As of 2022, the percentage of HIV-positive cases in the Bardez, Tiswadi, Mormugao, and Salcete subdistricts of Goa ranged from 10 to 21%. These areas experience a high burden of HIV cases. Moving to the medium percentage category, we have the Ponda Sub-district in South Goa and the Pernem Sub-district in North Goa, with the percentage of HIV-positive cases ranging between 2 and 5%. In the remaining subdistricts, namely Bicholim, Sattari, Dharbandora, Quepem, and Canacona, the percentage of HIV-positive cases is relatively low, ranging between 1 and 2%. However, the Sanguem Sub-district in South Goa stands out with a very low percentage of HIV-positive cases, ranging between 0.8 and 1%. These percentages reflect the varying burden of HIV across different subdistricts in Goa.

7.8 : Stratification of ICTCs/PPTCTs as per percentage of GC diagnosed HIV positive at sub district level ,State of Goa during the year 2021-22



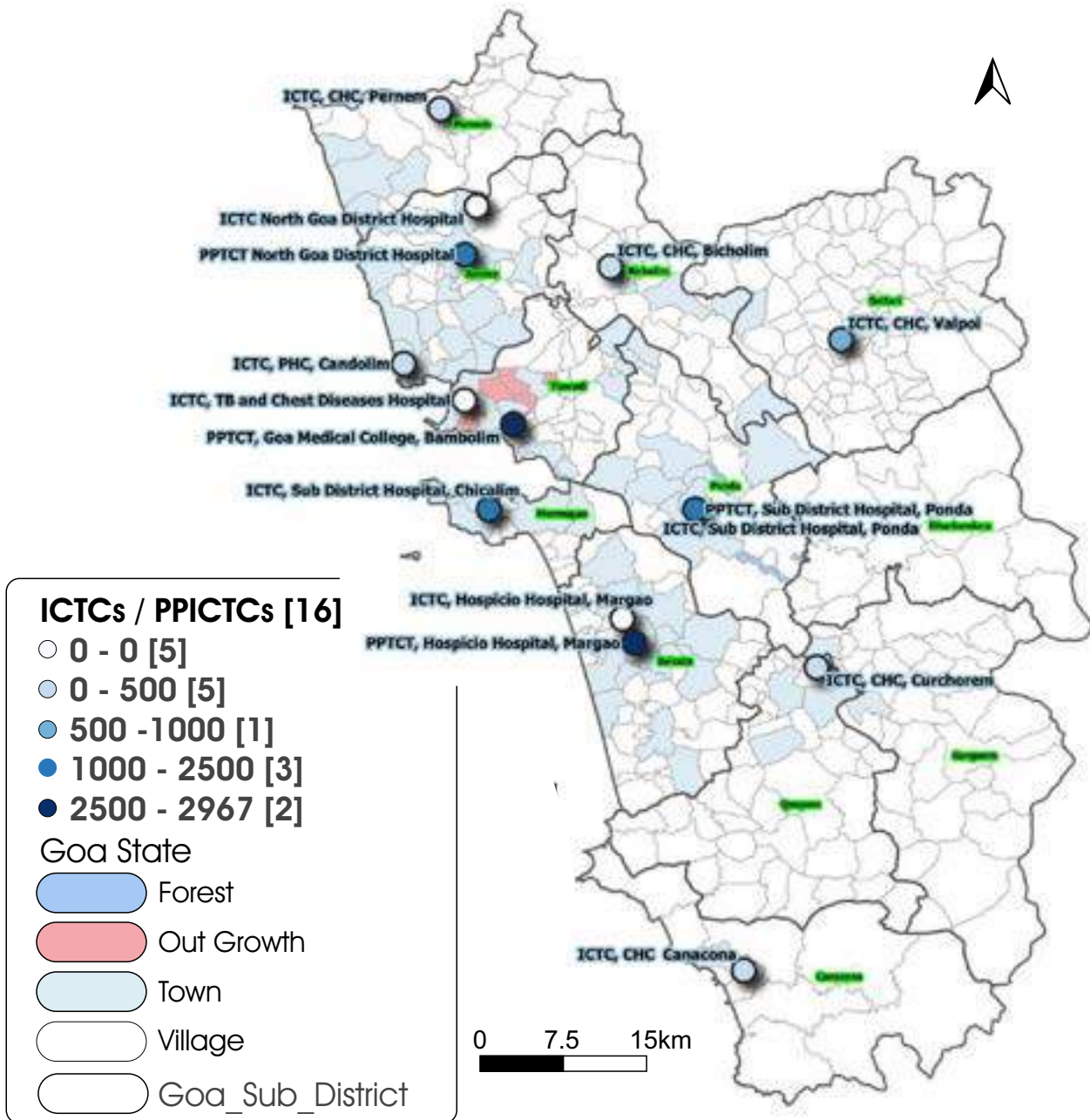
In North Goa district, there are five ICTC/PPTCT centers where the percentage of HIV-positive cases among general clients falls within the range of 0.2-1, while four centers fall within the range of 0-0.2. In South Goa district, five centers have diagnosed cases in the range of 0.2-1.1. In Quepem, the prevalence of HIV-positive cases among general clients is within the range of 0-0.2. The ICTC/PPTCT center in Canacona does not report any activity related to HIV-positive cases among general clients. The percentage of HIV-positive cases among general clients is high (ranging from 0.20-1.00) in Tiswadi, Ponda, Bicholim, and Salcette. However, in Sattari, Quepem, and Pernem, their percentage is low, ranging between 0.00-0.20%. Overall, the percentage of HIV-positive cases among general clients is high in central coastal areas with urban populations. Notably, the ICTC center at Goa Medical College, Bambolim, in Tiswadi subdistrict shows the highest HIV positivity among general clients, reaching 1.99.

7.9 : Stratification of ICTCs/PPTCTs as per percentage of PW diagnosed HIV positive linked to HIV Care at sub district level ,State of Goa during the year 2021-2022



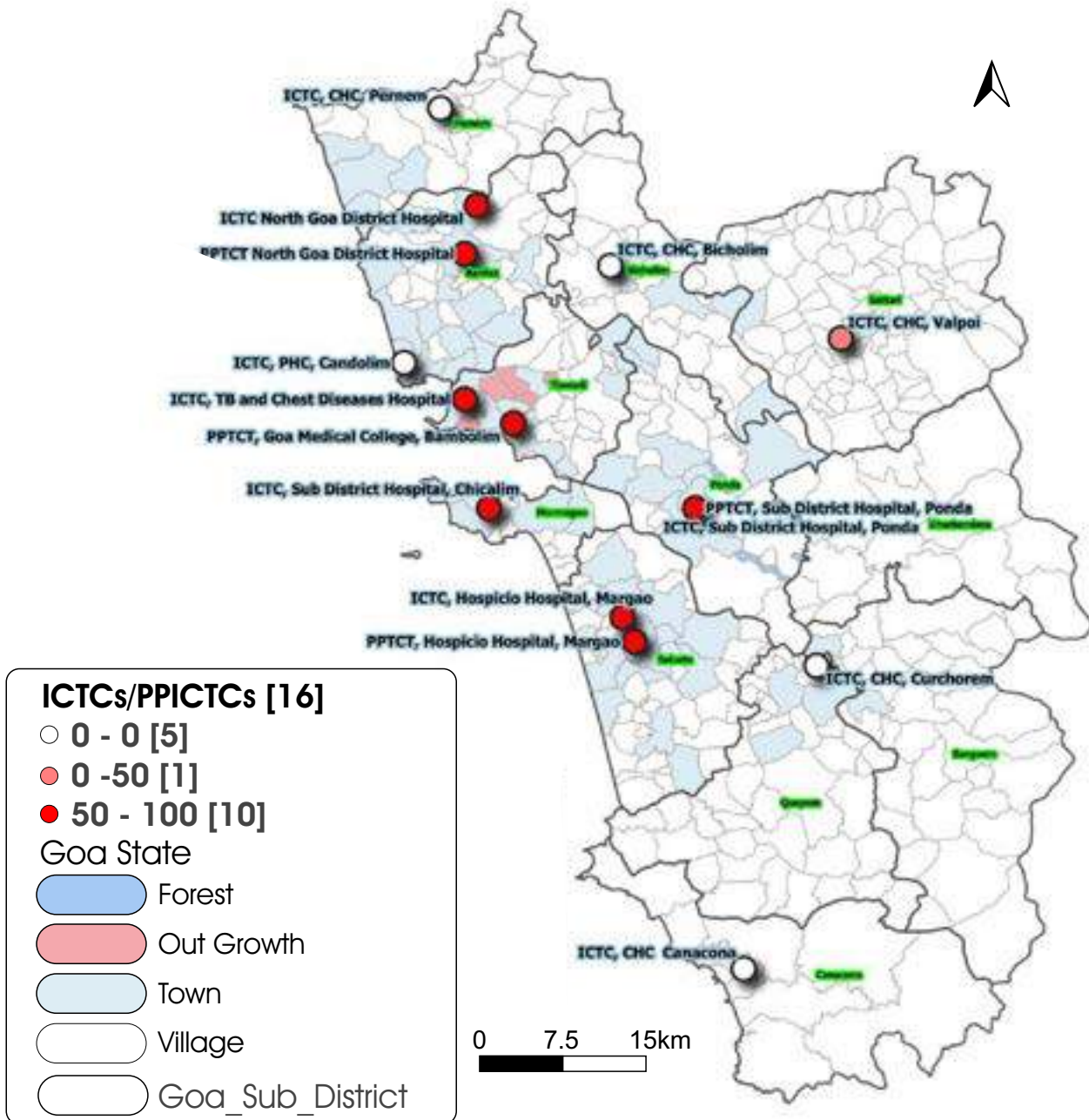
In North Goa, there are three centers, and in South Goa, there are four centers where the percentage of pregnant women diagnosed with HIV and linked to HIV care falls within the range of 1-100%.

7.10 : Stratification of ICTC/PPTCTs as per PW Tested for HIV at sub district level ,State of Goa during the year 2021-2022



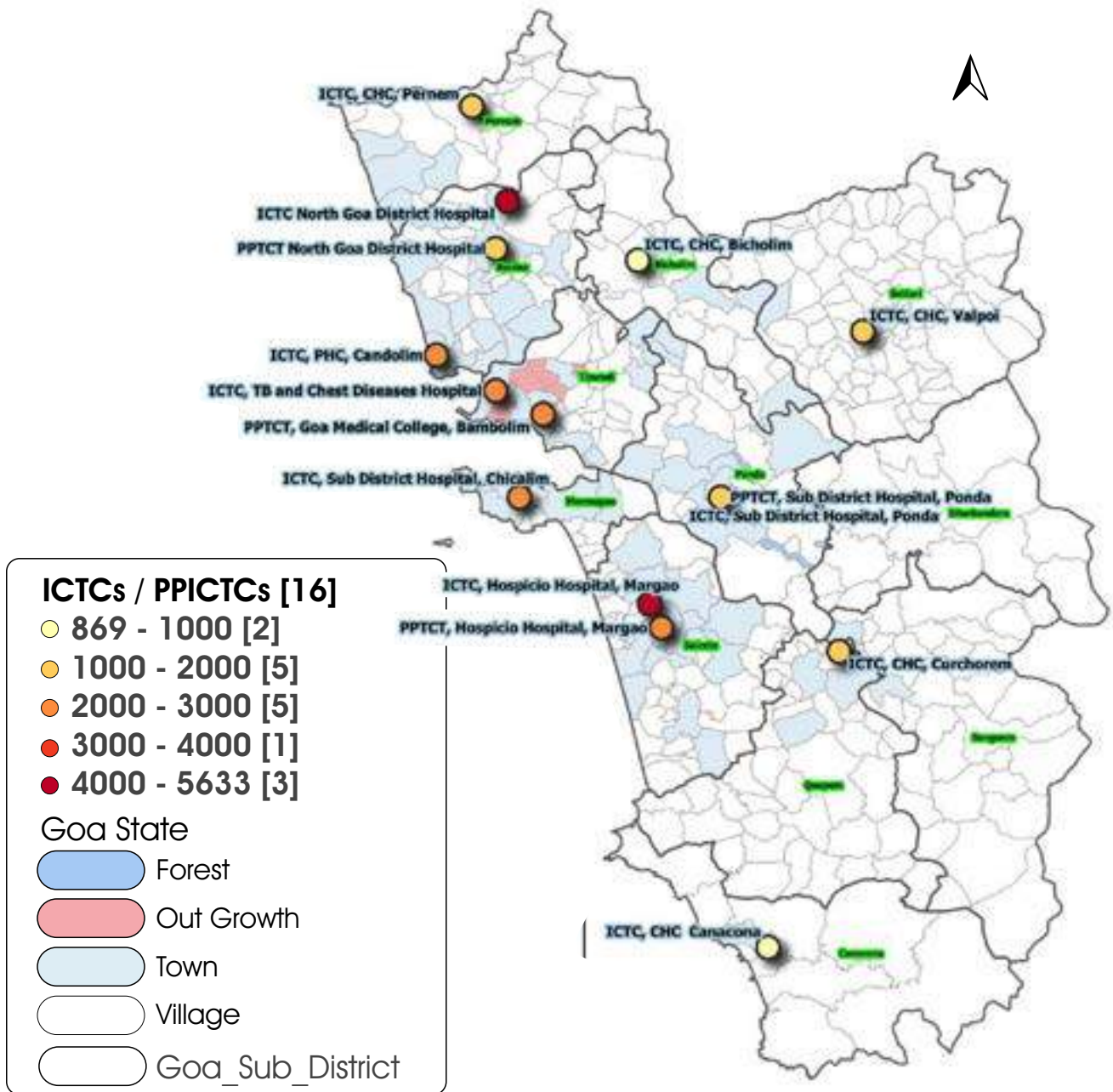
There are four PPTCT (Prevention of Parent-to-Child Transmission) centres in Goa. Among these, two centres located in Tiswadi, North Goa, and Salcette, South Goa, have a higher number of pregnant women tested for HIV, ranging from 2500 to 2967. The other two PPTCT centres in Bardez and Ponda tested between 1000 and 2500 pregnant women. Additionally, one ICTC (Integrated Counselling and Testing Centre) centre in Mormugao also tested pregnant women within this range. With the exception of one ICTC centre in Sattari, the remaining ICTC centres have tested between 0 and 500 pregnant women. In subdistricts where both PPTCT and ICTC centres are available, data pertaining to PW shows nil Status. Overall, the map indicates that PPTCT centres are actively testing a higher number of pregnant women to prevent parent-to-child transmission of HIV.

7.11 : Stratification of ICTC/PPTCTs as per % spouse /partners diagnosed HIV Positive at subdistrict level, State of Goa during the year 2021-22



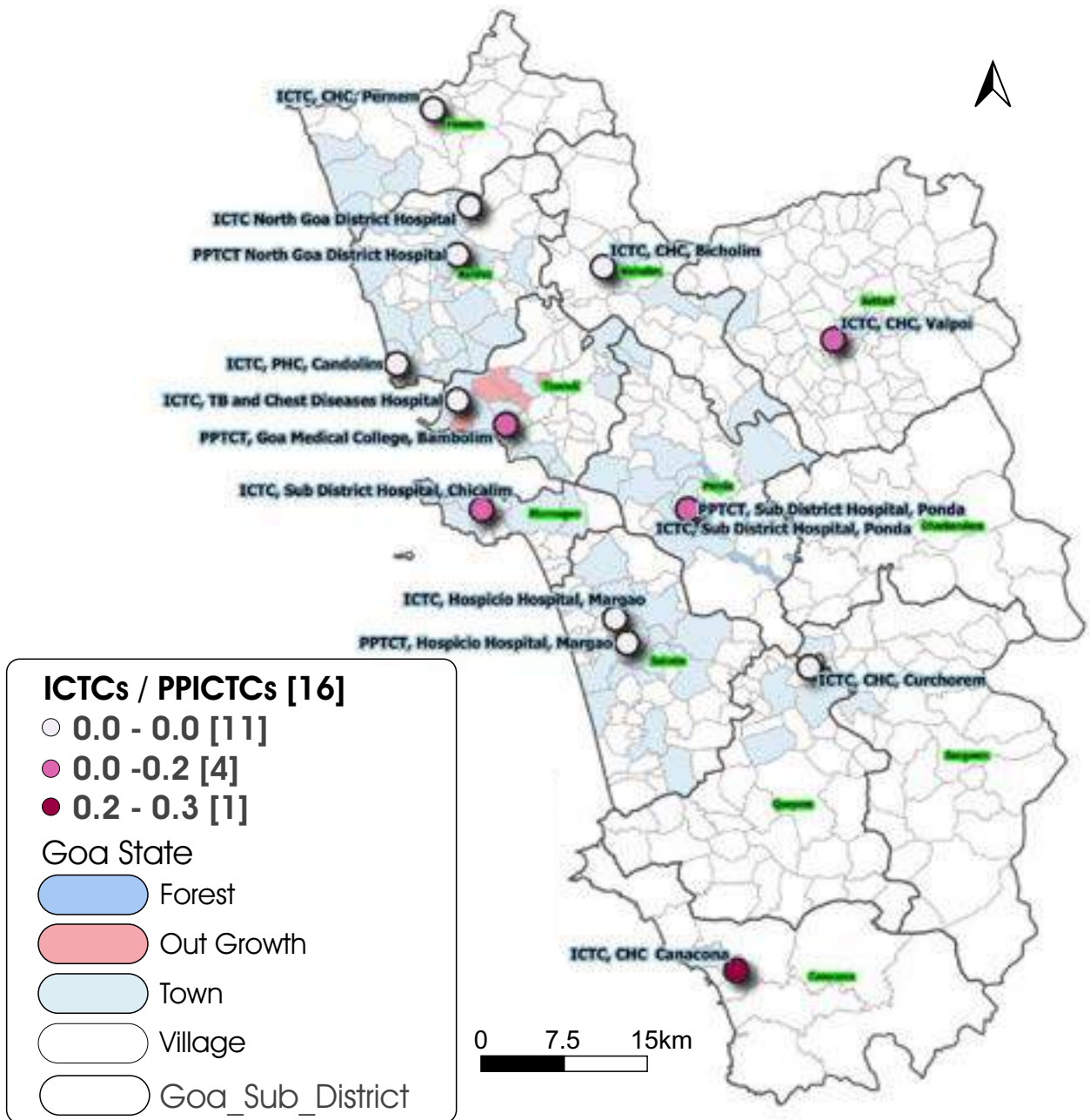
Six of Goa's sixteen facilities have 100% spouse or partner HIV positivity, including two in Ponda and one in each of the subdistricts of Salcette, Mormugao, Tiswadi, and Bardez. In four centres, partner positivity ranges from 50 to 100. They are the two remaining Centers in Tiswadi, one in Salcete and one in the Bardez subdistrict. One facility in Satari reports that 50% of HIV-positive individuals' partners are positive. No HIV-positive cases were detected during partner or spouse testing at the Pernem, Bicholim, Bardez, Quepam, and Canacona centres

7.12 : Stratification of ICTC/PPTCTs as per No.of Person Tested for HIV at subdistrict level, State of Goa during the year 2021-22



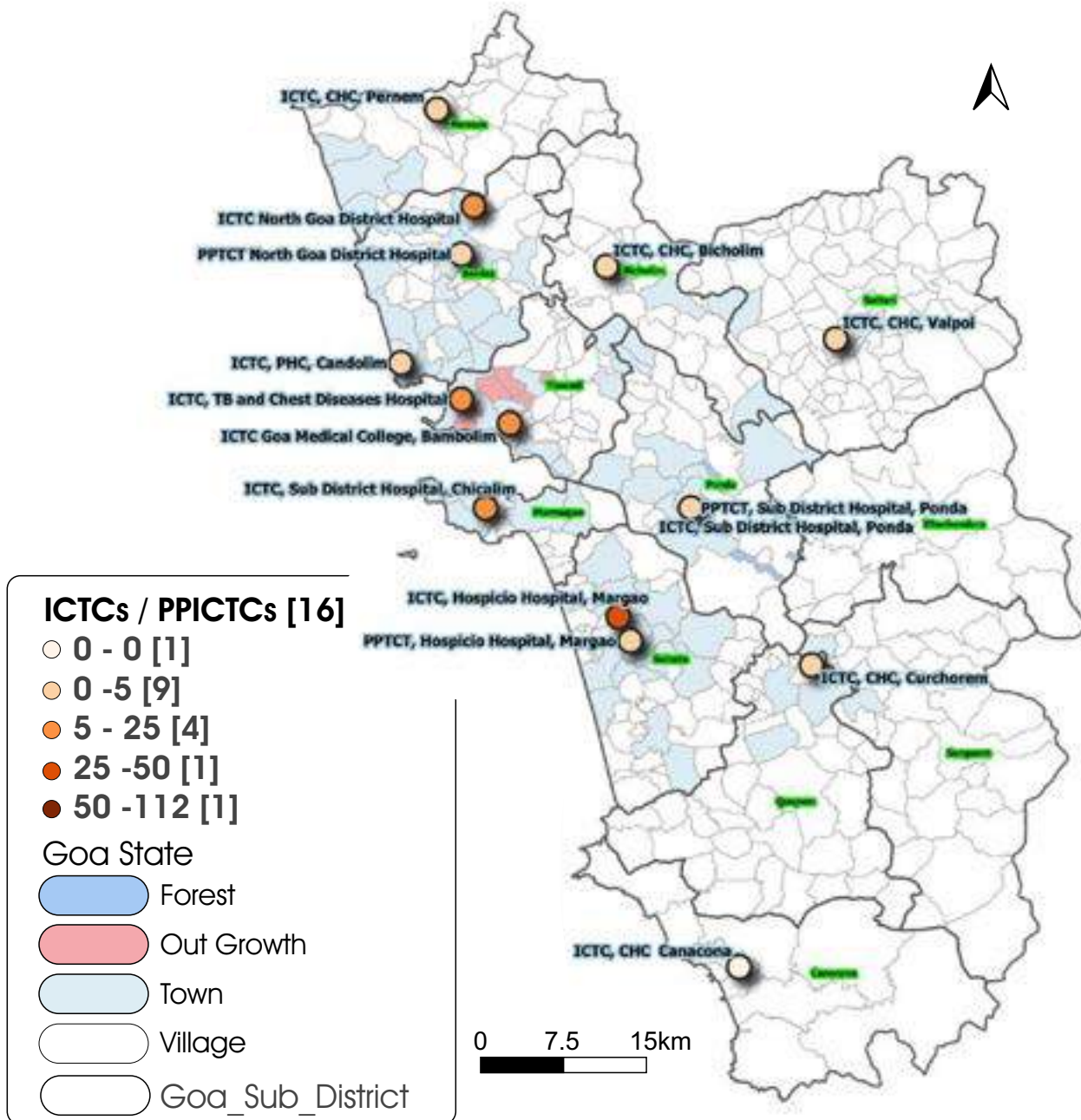
More than 5,000 people have been tested at two ICTC centres: one each in Tiswadi and Bardez. Next to that, the ICTC centre in Salcete examined 4865 people, followed by the centre in Ponda. Between 2000 and 3000 persons have been tested at two centres in Tiswadi, one in Bardez, Salcete, and Mormugao. With the exception of one in Bicholim and one in Canacona, the remaining locations have tested between 1000 and 2000 people

7.13 : Stratification of ICTC/PPTCTs as per percentage of PW diagnosed HIV positive at sub district level ,State of Goa during the year 2021-2022



Among the 16 centres, the ICTC centre in Canacona subdistrict exhibits the highest percentage of HIV positivity among pregnant women, at 0.3%. Four centres, located in Mormugao, Tiswadi, Ponda, and Satari subdistricts, report a positivity percentage ranging from 0.0 to 0.2% among pregnant women. On the other hand, the remaining centres in Salcete, Quepem, Bardez, Bicholim, and Tiswadi show no cases of HIV positivity among pregnant women.

7.14 : Stratification of ICTC/PPTCTs as per no.of persons diagnosed HIV positive at sub district level ,State of Goa during the year 2021-2022.

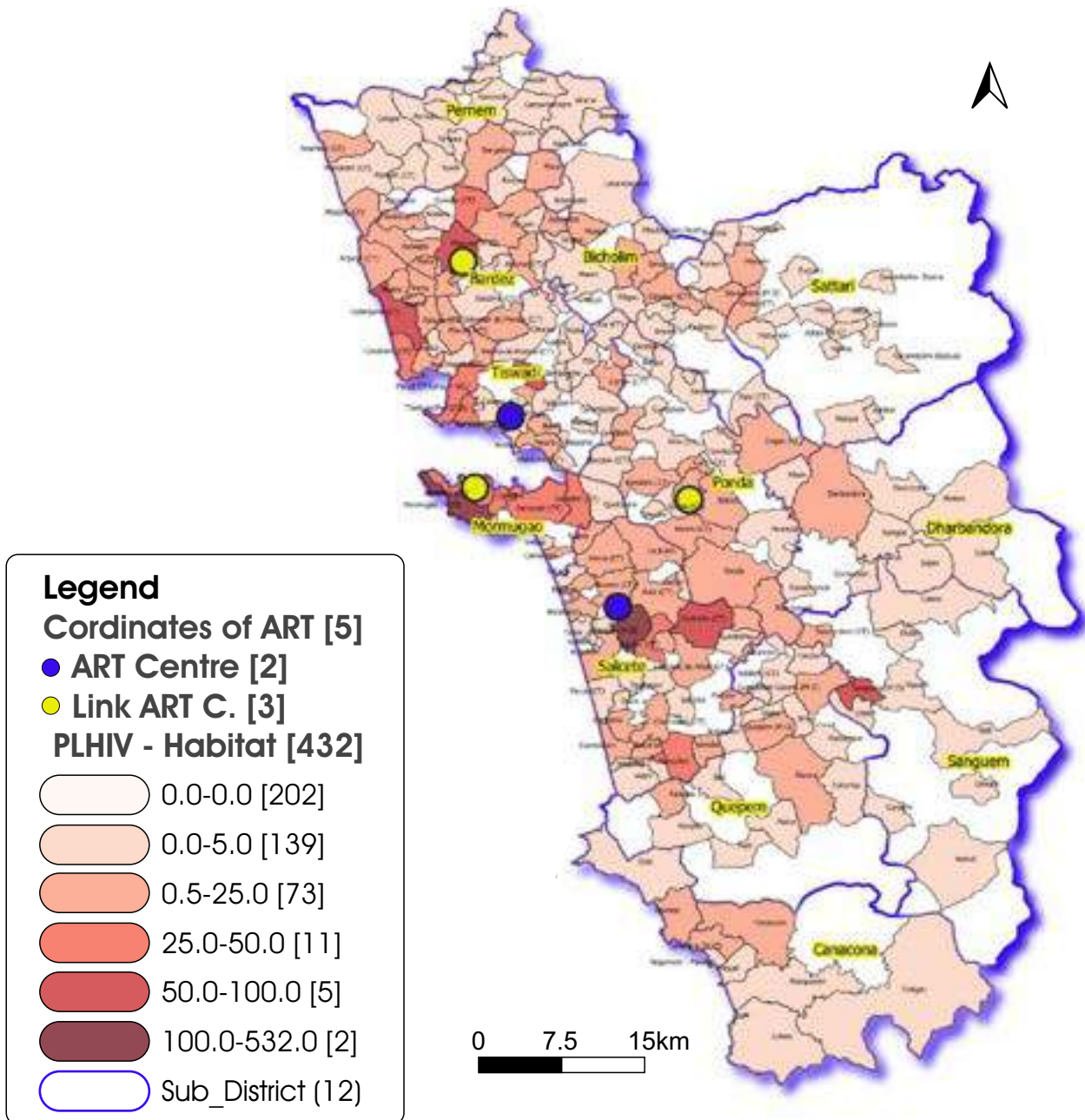


Among the 16 centres, the ICTC at Goa Medical College in Bambolim, Tiswadi subdistrict, reports the highest number of HIV-positive cases, with 112 cases. Following closely is the ICTC at Hospicio Hospital in Margao, Salcete subdistrict, with 33 cases. In Tiswadi subdistrict, there are two centres that diagnose HIV-positive cases, along with one centre each in Bardez, Mormugao, Salcete, and Bicholim subdistricts, all reporting cases in the range of 5 to 25. The remaining 7 centres diagnose HIV-positive cases in the range of 0 to 5, except for the ICTC centre in Canacona, which reported zero positive cases.

SECTION - III

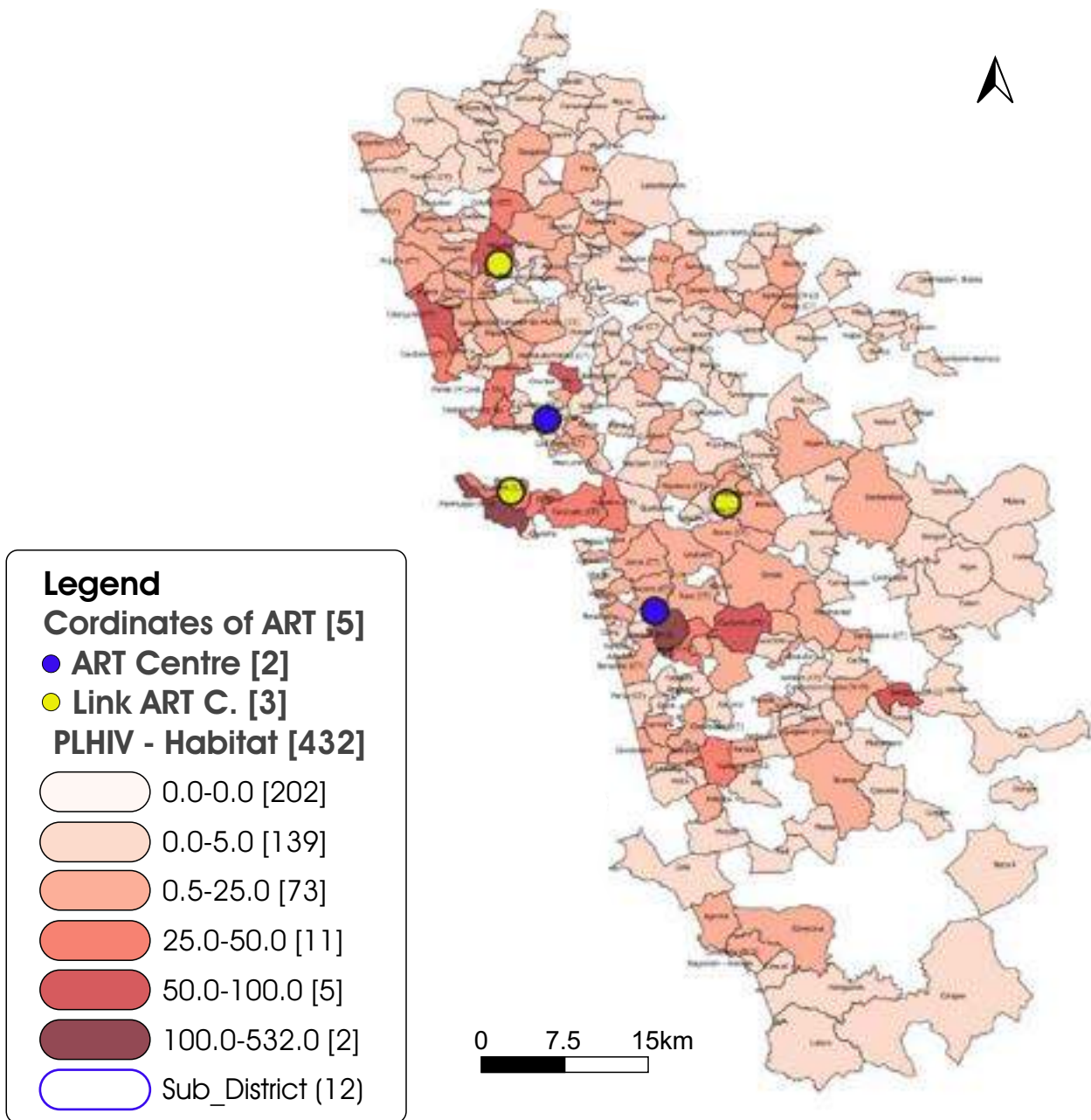
8 : Distribution of PLHIV at Habitat level Geo-mapping of Distribution and Performance of Public Health Facilities and Spatial analysis of burden of HIV/AIDS at habitat level, of Goa SACS

8.1 : Distribution of People Living with HIV (PLHIV) Cumulatively at Habitat level and ART and Link ART Centres, at Subdistrict level in the State of Goa



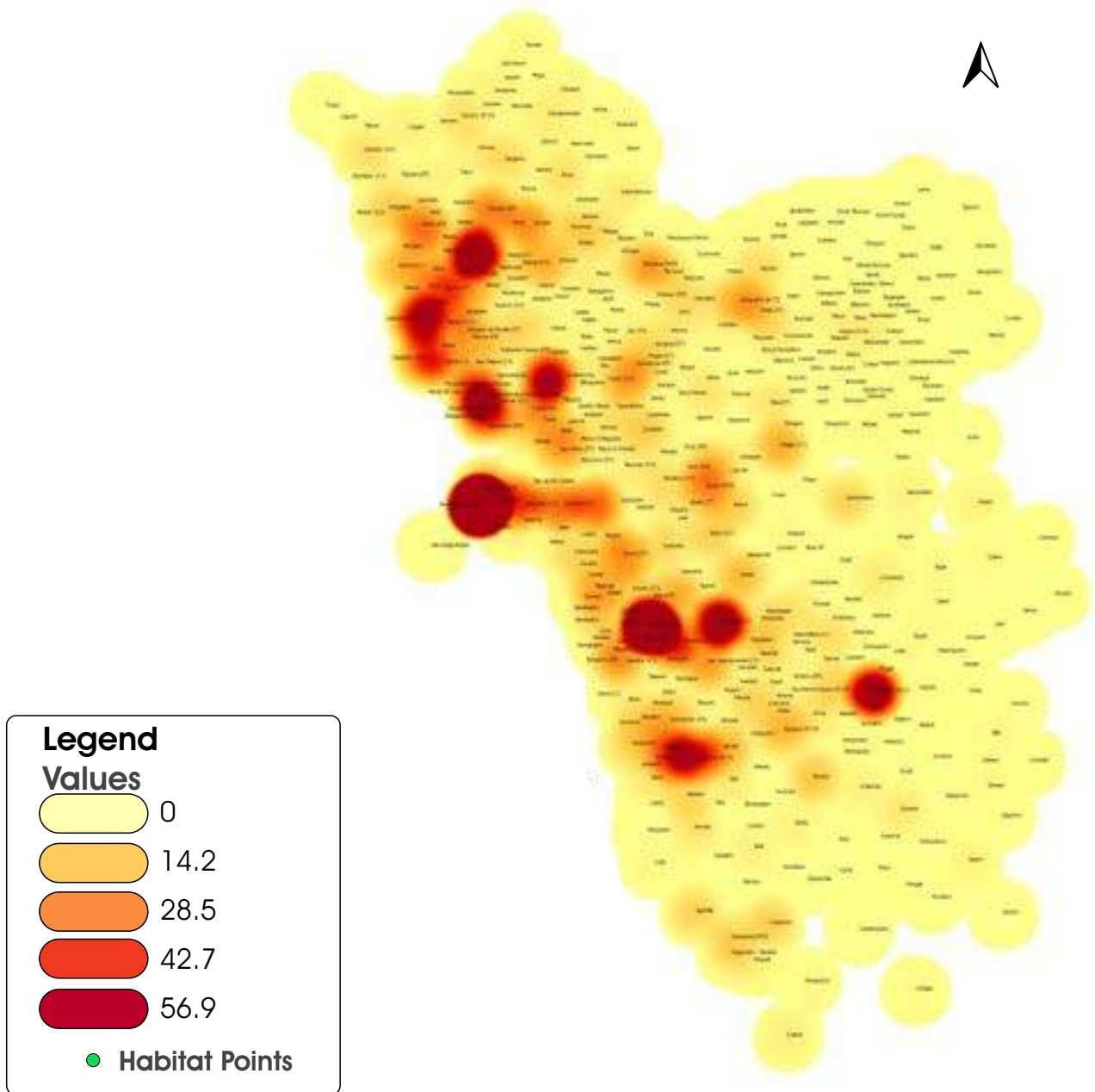
With the highest incidence observed in the Mormugao and Salcete subdistricts, South Goa district alone contributes to 65% of the PLHIV cases in Goa. It is noteworthy that both the ART centers in Mormugao and Salcete are conveniently located within close proximity to this affected population. The remaining ART facility is situated in the Tiswadi Sub district; however, it serves an area with a relatively low incidence of HIV. On the other hand, the link ART center in Ponda is located in an environment where PLHIV cases range from 5.0 to 25.0, while the link ART center in Bardez subdistrict serves an area with a higher prevalence of HIV. The map clearly depicts the concentration of ART/link ART centers in regions with high incidence rates. Despite the presence of PLHIV patients, it is evident that the eastern and western regions of Goa lack such centers to cater to the needs of the local community.

8.2 : Distribution of People Living with HIV (PLHIV) Cumulatively at Habitat level and ART and Link ART Centres, at Subdistrict level in the State of Goa



There is one ART Centre situated in Bambolim, Tiswadi, serving an area with a low density of PLHIV, while the other ART Centre is located in Nuvem, Salcette, which has a high density of PLHIV. Additionally, a Link ART Centre is situated in Mapusa, Bardez, where there is a significant prevalence of PLHIV. In Mormugao, another high-prevalence area, the Link ART Centre is located in Chicalim, close to the densely affected region. In Ponda, the Link ART Centre is situated in the Quela region, where there is a moderate density of PLHIV. It is worth noting that no ART centres exist in other regions. Most of the ART/Link ART centres are strategically placed in areas with moderate to high prevalence of PLHIV, except for the centre in Tiswadi. Among the habitats, 47% do not report any PLHIV cases, while 32% have PLHIV levels below 5. Furthermore, there are seven habitats with PLHIV cases ranging from 50 to 532 (as of 2023).

8.3 : Hots spots of PLHIV habitats



Hot spots are an emerging and dynamic concept that evolves over time based on disease spread. These hot spots are primarily located in coastal areas such as Mormugao, Salcete, Bardez, and Tiswadi. The spatial distribution of hot spots provides valuable information for program managers, subdistrict health administrations, and local health authorities. It enables them to devise effective strategies aimed at reducing the spread of diseases.

9 : Summary and Conclusions

- The field of Health Geographic Information Systems (Medical GIS) has proven to be extremely valuable in gaining a comprehensive understanding of public health. This collection of maps provides a detailed visual representation of disease patterns and geographical profiling within the state, offering valuable insights for actionable measures. Medical Geographic Information Systems (Medical-GIS) have been effectively utilized for decades to mark and plan responses to epidemic outbreaks. Today, they can be effectively deployed to illustrate the spread of diseases, track progress in implementing mitigation measures, and showcase outcomes over time and space.
- GIS offers a comprehensive visualization of analysed data and highlights correlations between neighboring sub-districts, towns, and geographical boundaries. These maps identify areas with high disease incidence, indicating priority areas that require targeted interventions.
- People Living with HIV (PLHIV) are distributed across all blocks and the majority of towns. Salcete and Mormugao sub-districts account for 50% of the PLHIV burden. Additionally, towns and outgrowths contribute to 72% of the PLHIV load.
- The distribution of PLHIV at the habitat level, as depicted by GIS maps, reveals areas with high and low disease burdens. Most NGOs are located in town areas. By mapping the high and low-burden habitats, NGOs can be effectively reallocated within the state.
- The state of Goa has two ART centers and three Link ART centers. Based on the burden of PLHIV at the habitat level, these GIS maps will facilitate the scaling up or scaling down of Link ART Centers.
- Surveillance centers are established in all blocks, with a higher burden observed in town areas.
- In the upcoming years, it is crucial to focus on preventing new infections in 202 villages across all blocks.
- The state can optimize resource allocation based on disease burdens as indicated by GIS maps.
- By utilizing burden-based disease mapping and hotspot analysis, Goa SACS can effectively rationalize IEC and BCC activities.
- The majority of FICTCs are located in the western and central regions of Goa, with fewer centers in the southern and eastern parts.
- The Monitoring and Evaluation division of Goa SACS can leverage GIS technology to assess the productivity and performance of healthcare facilities/centers under the HIV/AIDS program, providing timely and valuable insights for targeted interventions.

List of Contributor

National Institute of Public Health Training & Research. Mumbai

Planning, Data analysis, Geo-special Analysis, mapping and Drafting Atlas

Dr. Sunil Gitte, Director, NIPHTR

Assisted in drafting and editing of Atlas

Dr Krishnaja NP, Medical Officer, NIPHTR

Goa SAC

Coordination, data validation and technical inputs in Atlas

1. Dr. Gokuldas Sawant, Project Director, Goa SACS

2. Ms. Sulaksha Galyekar, Assistant Director (Strategic Information), Goa SACS

Data collection, data validation, data cleaning etc and preparation of various sheets as per variables

3. Shri. Sandesh K. Bhagat, Computer Literate Steno, Goa SACS

4. Ms. Preetam Naik, Data Manager, ART Centre, Hospicio Hospital, Margao.

5. Shri. Jeetendra Bhagat, Data Manager, ART Plus Centre, Goa Medical College, Bambolim Goa.

Designing of Atlas

Mr. Shrinivas Mehetre, Junior Artist, NIPHTR



National Institute of Public Health Training and Research, Mumbai
Mumbai Campus : 332, S. V. P. Road, Khetwadi, Girgaon, Mumbai - 400 004.
Navi Mumbai Campus : Plot No-6 & 6A, Sector -18, Khanda colony , New Panvel, Navi Mumbai - 410 218.
Email : directer.fwtrc@nic.in website : fwtrc.gov.in