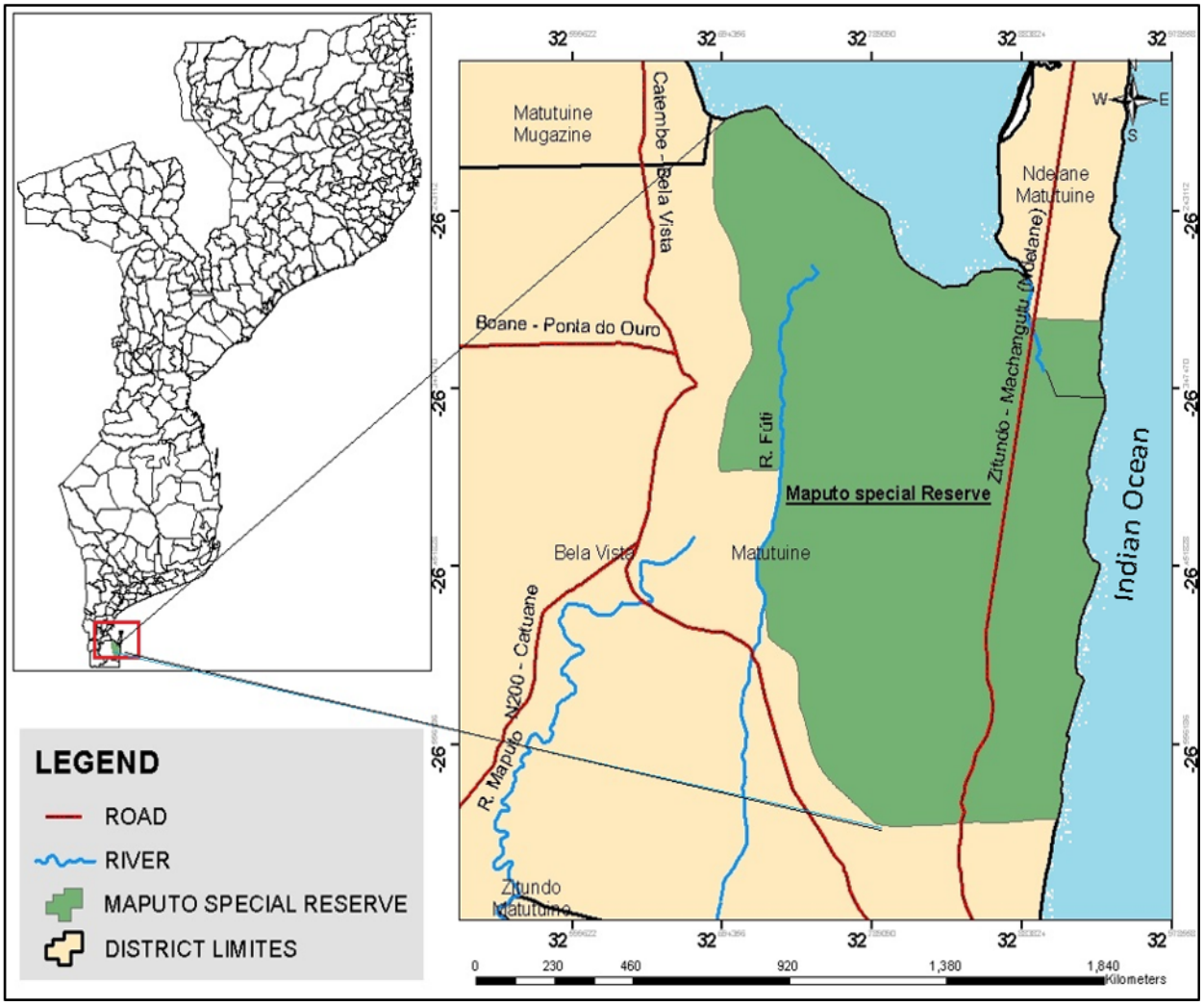
Project Update: March 2020

This project was approved in October in 2019 and since then several activities have been carried out.

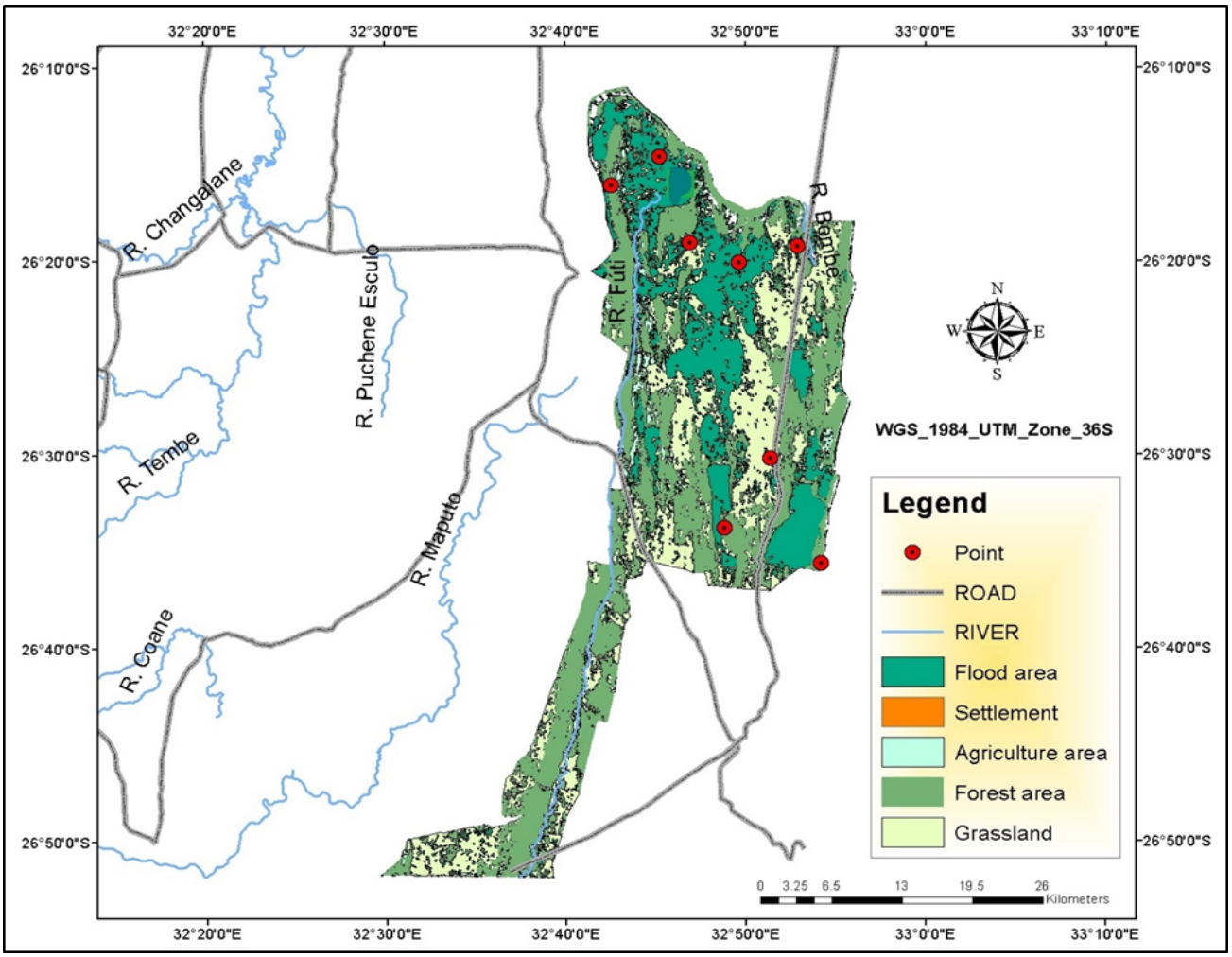
We have done the assessment of the state of invasive plant species in Maputo special reserve where data has been gathered to help the administration on the management and planning on control measures (for project area refer to map below).



These activities were carried out from January – March 2020 and the data collected has been on the spatial distribution of invasive plant species in the reserve, whereby we have been able to map all the invasive plants in the area to help the reserve management in the control and management of invasive plants. We have also assessed and documented the most abundant invasive plants with their coverage. The factors responsible for the occurrence of invasive plants in the project area have also been documented to help in the management action.

For a proper management plan, the data on the state of invasive plants has been collected in different land use and vegetation strata of the area ranging from settlement (old and current), agriculture area ,flooded area ,grassland as well as forest area (open and closed) (refer to table below).

Classes of land use and vegetation cover	Area		Project Sample point considered
	Ha	%	
flooded area	26953.76	34.78	2
Settlement (old and current)	1.55	0.002	1
Agriculture area	3362.92	4.34	1
forest area (Open and closed)	26137.51	33.72	2
Grasslands	19446.72	25.09	2

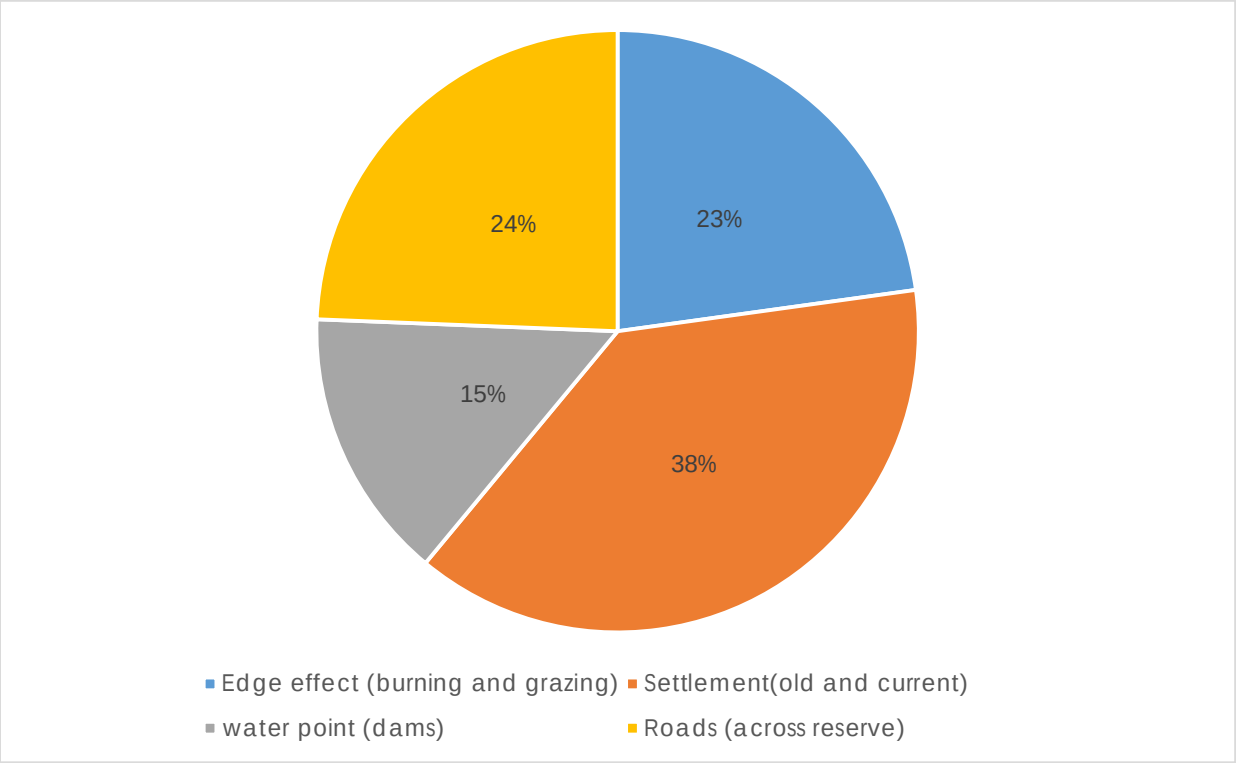


Illustrate the land use and land cover change formations of the Maputo special reserve and the project sampling points where data was collected.

To ascertain the validity of this area we randomly established the project sample points in order to have an entire understanding of the reserve state on invasive plants species.

For the project sample points considered, a total of eight points were assessed as shown on the map above

We documented the factors responsible for the occurrence of invasive plants in the reserve and we were able to document and identify the abiotic factors are the most responsible for invasive plants in this area refer to the results below.



We were able to document that the frequencies of the different factors associated with the occurrence of invasive plant species in the project area were mostly disturbances by humans, which include disturbances related to settlements (38.2%) followed by roads (24.4%), edge effects such as burning and grazing of cattle (22.8%) and dams (14.6%).

For the invasive plant species documented they vary in terms of abundance and coverage as shown in the tables below that give a general overview of the abundance and coverage across different strata of the reserve.

Most abundant invasive plant species in the settlement stratum of the reserve.

Scientific name	**Fr(abs)**	**Fr (%)**	**Ab (abs)**	**Ab (%)**	**pi**	**ln(pi)**	**H"**	**D"**
Acacia decurrens	0.285714	6.896552	9.89011	2.95082	0.030612	-3.48636	0.106725	72
Agave americana L	0.142857	3.448276	10.98901	3.278689	0.034014	-3.38099	0.115	90
Agave sisalana Perrine	0.285714	6.896552	9.89011	2.95082	0.030612	-3.48636	0.106725	72
Albizia lophantha	0.142857	3.448276	7.692308	2.295082	0.02381	-3.73767	0.088992	42
araserianthes lophantha	0.142857	3.448276	7.692308	2.295082	0.02381	-3.73767	0.088992	42
Caesalpinia decapetala	0.142857	3.448276	8.791209	2.622951	0.027211	-3.60414	0.098072	56
Cirsium vulgare (Savi) Ten	0.142857	3.448276	7.692308	2.295082	0.02381	-3.73767	0.088992	42
Eucalyptus sp	0.142857	3.448276	48.35165	14.42623	0.14966	-1.89939	0.284262	1892
Ipomea alba	0.571429	13.7931	29.67033	8.852459	0.091837	-2.38774	0.219283	702
ipomea indica	0.285714	6.896552	32.96703	9.836066	0.102041	-2.28238	0.232896	870
Lantana camara	0.714286	17.24138	60.43956	18.03279	0.187075	-1.67625	0.313584	2970
Opuntia monacantha Haw	0.142857	3.448276	7.692308	2.295082	0.02381	-3.73767	0.088992	42
pennisetum setaceum	0.142857	3.448276	10.98901	3.278689	0.034014	-3.38099	0.115	90
Pinanga coronate	0.142857	3.448276	3.296703	0.983607	0.010204	-4.58497	0.046785	6
Ricinus communis L	0.285714	6.896552	16.48352	4.918033	0.05102	-2.97553	0.151813	210
Solanum elaeagnifolium Cav	0.285714	6.896552	18.68132	5.57377	0.057823	-2.85037	0.164817	272
Solanum mauritianum Scop	0.142857	3.448276	43.95604	13.11475	0.136054	-1.9947	0.271388	1560
	4.142857	100	335.1648	100	1.037415	-52.9408	2.582318	9030
								0.90261

Most invasive plants in agriculture stratum of the reserve

Scientific name	**fr(abs)**	**Fr (%)**	**Ab (abs)**	**Ab (%)**	**pi**	**ln(pi)**	**H'**	**D'**
Agave sisalana Perrine	0.2	4.347826	7.692308	1.440922	0.01087	-4.52179	0.04915	20
Coreopsis lanceolata L	0.2	4.347826	15.38462	2.881844	0.021739	-3.82864	0.083231	90
Datura stramonium L	0.2	4.347826	15.38462	2.881844	0.021739	-3.82864	0.083231	90
Ipomea alba	0.8	17.3913	80	14.98559	0.113043	-2.17998	0.246433	2652
ipomea indica	0.6	13.04348	113.8462	21.32565	0.16087	-1.82716	0.293935	5402
Lantana camara	0.6	13.04348	90.76923	17.00288	0.128261	-2.05369	0.263408	3422
Lilium formosanum Wallace	0.2	4.347826	9.230769	1.729107	0.013043	-4.33947	0.056602	30
Pinanga coronate	0.2	4.347826	23.07692	4.322767	0.032609	-3.42318	0.111625	210
Ricinus communis L	0.6	13.04348	50.76923	9.510086	0.071739	-2.63472	0.189012	1056
Solanum mauritianum Scop	0.4	8.695652	123.0769	23.05476	0.173913	-1.7492	0.304209	6320
Xanthium spinosum L	0.2	4.347826	4.615385	0.864553	0.006522	-5.03261	0.032821	6
	4.2	91.30435	533.8462	100	0.754348	-35.4191	1.713658	19298
								0.839266

Most invasive plant species in the grass land stratum of the reserve.

Scientific name	**fr(abs)**	**Fr (%)**	**Ab(abs)**	**Ab (%)**	**pi**	**ln(pi)**	**H'**	**D'**
Atriplex inflata f. Muell.	0.25	14.28571	7.692308	3.252033	0.03252	-3.42589	0.111411	12
Cotoneaster pannosus Franch.	0.25	14.28571	67.30769	28.45528	0.284553	-1.25684	0.357636	1190
Cuscuta suaveolens Ser	0.25	14.28571	48.07692	20.3252	0.203252	-1.59331	0.323843	600
Ipomea alba	0.25	14.28571	26.92308	11.38211	0.113821	-2.17313	0.247348	182
Lantana camara	0.25	14.28571	38.46154	16.26016	0.162602	-1.81645	0.295358	380
Pinanga coronate	0.5	28.57143	48.07692	20.3252	0.203252	-1.59331	0.323843	600
	1.75	100	236.5385	100	1	-11.8589	1.65944	2964

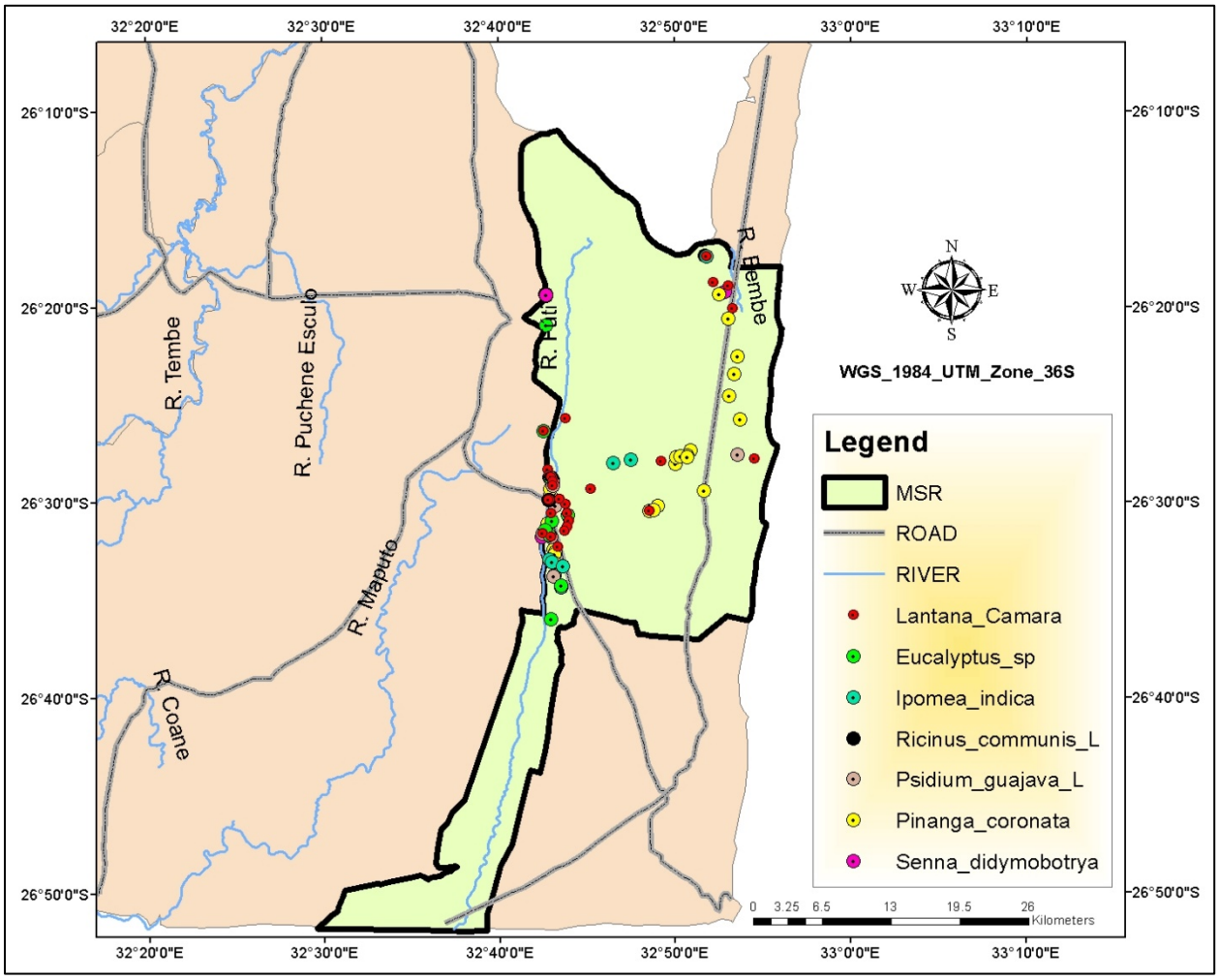
Most invasive plant species in the Forest stratum of the reserve.

Scientific name	**fr(abs)**	**fr (%)**	**Ab(abs)**	**Ab (%)**	**pi**	**ln(pi)**	**H'**	**D'**
Acacia decurrens	0.133333	3.448276	5.128205	1.748252	0.017483	-4.04655	0.070744	90
cesalpinia decapetala	0.066667	1.724138	2.051282	0.699301	0.006993	-4.96284	0.034705	12
Chondrilla juncea L	0.066667	1.724138	7.179487	2.447552	0.024476	-3.71008	0.090806	182
choromolaena odorata	0.266667	6.896552	10.25641	3.496503	0.034965	-3.35341	0.117252	380
Datura stramonuim	0.066667	1.724138	2.564103	0.874126	0.008741	-4.7397	0.041431	20
Eucalyptus sp	0.533333	13.7931	83.07692	28.32168	0.283217	-1.26154	0.35729	26082
Ipomoea carnea fistulosa	0.333333	8.62069	13.84615	4.72028	0.047203	-3.0533	0.144124	702
Lantana camara	0.866667	22.41379	71.79487	24.47552	0.244755	-1.4075	0.344492	19460
Melia azedarach	0.133333	3.448276	5.128205	1.748252	0.017483	-4.04655	0.070744	90
Opuntia monkacantha	0.066667	1.724138	1.538462	0.524476	0.005245	-5.25053	0.027538	6
Parthenium hysterophorus	0.066667	1.724138	4.102564	1.398601	0.013986	-4.2697	0.059716	56
Pinanga coronata	0.466667	12.06897	23.07692	7.867133	0.078671	-2.54248	0.20002	1980
Senna bicapsularis	0.2	5.172414	12.82051	4.370629	0.043706	-3.13026	0.136812	600
sesbania punicea	0.133333	3.448276	6.153846	2.097902	0.020979	-3.86423	0.081068	132
Solanum elaeagnifolium Cav	0.066667	1.724138	10.25641	3.496503	0.034965	-3.35341	0.117252	380
Solanum mauritianum	0.4	10.34483	34.35897	11.71329	0.117133	-2.14445	0.251185	4422
	3.866667	100	293.3333	100	1	-55.1365	2.14518	54594
								0.832848

Invasive plants species in the flooded areas stratum of reserve.

Scientific name	**fr(abs)**	**fr (%)**	**Ab(n/ha)**	**ab (%)**	**pi**	**ln(pi)**	**H'**	**D'**
Arundo donax L	0.083333	7.142857	64.10256	14.45087	0.144509	-1.93442	0.27954	9900
Egeria densa Planch.	0.083333	7.142857	5.128205	1.156069	0.011561	-4.46014	0.051562	56
Nephrolepis exaltata (L.)	0.166667	14.28571	192.3077	43.3526	0.433526	-0.8358	0.362343	89700
Pennisetum setaceum	0.083333	7.142857	32.05128	7.225434	0.072254	-2.62756	0.189853	2450
Pinanga coronata	0.083333	7.142857	32.05128	7.225434	0.072254	-2.62756	0.189853	2450
Senna didymobotrya	0.666667	57.14286	117.9487	26.5896	0.265896	-1.32465	0.352219	33672
	1.166667	100	443.5897	100	1	-13.8101	1.42537	138228
								0.710924

For the spatial distribution through using driven transects following different routes used by both employees and tourists, we were able to record all the coordinates where the most invasive plant species were observed across the reserve and the coordinates were added to the Maputo special reserve map (see below).



The most commonly observed invasive plant species were *Lantana camara, Euclayptus* sp ,*Ipomea indica* ,*Ricinus communis* L, *Psiduim guajava* L, *Pinanga ccoronata* and *Senna didymobotra* .The results show that most of the invasive plants are highly concentrated along the Futi River but *Lantana camara* is widely distributed throughout the reserve .

Life-form features of invasive plants species found in the study area.

1. *Lantana camara.*

It is a floriferous shrub growing up to 2 m or higher. Stems are four angled and covered with short stiff hairs. Leaves are dark green, pale yellow, rough and hairy. Flowers pink, red, orange, yellow or white in compact flat-topped heads. Fruits are glossy green turning purple black. It invades forests, savannahs and watercourses, roadsides and degraded land.

Left: Lantana camara. Right: Eucalyptus sp.

2. *Eucalyptus* sp

A tree tall perennial plant with an elongated measuring around 33 ft with a trunk and branches made of wood. It can live for many years. It is divided into four main parts: roots, trunks, branches and the leaves.

3. *Datura stramonium.*

An erect herbaceous annual plant growing up to 1.5 m. Stems sparsely hairy, green brown or purple. Leaves dark-green or purple ovate and up to 200 mm on long petioles. Leaf margins are coarsely and irregularly toothed or lobed. Flowers white, mauve or purple. Fruits are brown hardened capsules, ovoid up to 50 mm long by 30 mm wide, and covered with slender spines measuring 10 mm long.

Left: 3.Datura stramonium. Right: Ricinus comunis L.

4. *Ricinus comunis* L

An annual herb or softly woody shrub up to 4 m high. Leaves shiny, dark green or red and large up to 300 mm wide. Palmately five-nine-lobed, margins which are closely serrated. Flowers are reddish on the upper side and cream on the lower part and on stalks up to

150mm long. Fruits are green, brown or red-three lobbed capsules about 10-15mm long and covered with soft spines. Seeds are silvery mottled brown.

5. *Psidium guajava*

An evergreen shrub or small tree 2-10m high. Leaves bronze turning light-green, ovate to oblong-elliptic, often broad and rounded at both ends, with a small pointed apex. Flowers are white and in groups of 1-3. Fruits many seeded berries which are green turning yellow when ripe with white, yellow or pinkish flesh which is sweet and edible. It's cultivated for its fruits and invades forest margins, savannah, and roadsides.

6. *Caesalpinia decapelata.*

A robust thorny evergreen shrub 2-4m high or a climber up to 10m or higher forming dense thickets. Stems minutely golden-hairy, Stem thorns straight to hooked, numerous but not in regular rows or confined to nodes. Leaves dark green, pale beneath and up to 300 mm long. Fruits brown woody pods, flattened, unsegmented and smooth. Invades forest margins and gaps, plantations, roadsides and water courses.

Left: Psidium guajava. Right: Paninga coronata.

7. *Paninga coronata.*

A caespitose, monoecious plant, rather variable, with erect stems, 2-5 m tall, with a diameter of 3-5 cm, smooth, of green colour on which stand out the rings trace of the junction of the fallen leaves. The leaves are pinnate, usually ascending, 1.5 m long on an about 30 cm long petiole, of intense green colour and subdivided into pleated segments, about 25-70 cm long and of variable width, with sharp or truncated and toothed tip; the leaves, when opening, are often pink with light dots. The basal sheath of the leaf, of yellowish green colour, wraps wholly the stem for a length of about 30-50 cm.

8. *Ipomea alba*

An evergreen perennial climber growing to 10 m (32 ft) at a fast rate. It is hardy to zone. It is in leaf all year, in flower from February to August depending on environmental conditions. This plant can be weedy or invasive according to the authoritative sources (IUCN 2005).

9. Agave sisalana Perrine

A perennial plant that consist of a rosette of sword-shaped leaves about 1.5–2 m tall. Young leaves may have a few minute teeth along their margins, but lose them as they mature (Nobel, P.S. 1988).

10. Cirsium vulgare (Savi) Ten

A tall biennial or short-lived monocarpic thistle, forming a rosette of leaves and a taproot up to 70 cm long in the first year, and a flowering stem 1–1.5 m tall in the second. It sometimes functions as an annual, flowering in the first year. The stem is winged, with numerous longitudinal spine-tipped wings along its full length. The leaves are stoutly spined, grey-green, and deeply lobed; the basal leaves up to 15–25 cm long, with smaller leaves on the upper part of the flower stem; the leaf lobes are spear-shaped. The inflorescence is 2.5–5 cm diameter, pink purple, with all the florets of similar form. The seeds are 5 mm long, with a downy pappus.

11. Araserianthes lophantha

A shrub or small tree up to 6 m; smooth, dark grey, fissured rhytidome when old. Leaves: evergreen, alternate, bipinnate, of 12-23 cm long, with 8-13 pairs of pinnae, which in turn have 15-40 pairs of oblong asymmetric and mucronate, leaflets, each with 4-10 x 1-4 mm, dark green on the upper surface and much lighter on the lower surface.

12. Pennisetum setaceum

A tender perennial fountains. It is a clump-forming grass that produces arching, linear, narrow green leaves to and late flower spikes that rise above the foliage.

13. Prosopis velutina Wooton

The young bark is reddish-brown and smooth. It has yellow thorns up to l in long appear on the young branches. The leaves are about 3-6 in (7.5–15 cm) long, fine, and bipinnately compound.

14. Opuntia monacantha Haw

The green stems of this low-growing perennial cactus are flattened and are formed of segments. Barbed bristles are found around the surfaces of the segments, and longer spines are present. The flowers are yellow to gold in colour and are found along the margins of mature segments.

Left: Opuntia monacantha Haw. Right: Ipomea indica.

15. Solanum elaeagnifolium Cav

A perennial 10 cm to 1 m in height. The stems are covered with nettle-like prickles, ranging from very few on some plants to very dense on others. Leaves and stems are covered with downy hairs (trichomes) that lie against and hide the surface, giving a silvery or grayish appearance. The leaves are up to 15 cm long and 0.5 to 2.5 cm wide, with shallowly waved edges.

16. Ipomea indica

It bears heart-shaped or has 3-lobed leaves and rich purple funnel-shaped flowers 6–8 cm in diameter.

17. Solanum mauritianum Scop

A large shrub, 2 to 5 m high, branched, with foul smell. The branches are thick, cylindrical, tomentose, greyish green, branching dichotomously.

Left: Solanum mauritianum Scop. Right: Acacia decurrens.

18. Acacia decurrens.

A large shrub or tree with twice-compound dark green leaves. Its young branches are generally hairless with conspicuous wings or ridges that emanate from the leaf bases. its main leaf stalk is hairless with a small raised gland at the junction of each pair of leaf branchlets. Its yellow or golden-yellow flowers are borne in small globular clusters that are arranged into larger elongated compound clusters. It is fruit is an elongated and somewhat flattened pod 20-105 mm long.

19. Lilium formosanum Wallace

A perennial herb: bulb scales thickened, lanceolate; aerial stem annual, erect, slender, 0.5–2 m high. Leaves alternate, linear to lanceolate. Flowers are terminal.

20. Xanthium spinosum L

An erect, rigid, much-branched annual herb, 3-10 dm tall and up to 15 dm or wider. Stems are striate, yellowish or brownish gray, and finely pubescent. The cotyledons are in shape, differing in appearance.

21. Arundo donax L

A perennial grass that reach up to 20 ft height. It looks shorter when damaged or stressed. The stem resembles a corn stalk. Leaves are long, flat and grow up to 1.5 ft. Long. They are green or have variegated green and white stripes the length of the blade. It invades ditches, stream banks and lake shores. It competes for water, nutrients and radiation, suppresses and excludes native vegetation which degrades wildlife habitat, increases fire risks and interferes with flood control.

22. Egeria densa Planch.

Grows in water up to with trailing stems around 2 m long. The leaves are produced in whorls of four to eight, with a pointed leaf tip. The stem system grows spreading creating thick flower canopy in areas it occurs.

Next activities

We expect to go back to the field to meet the communities around the reserve, in this phase will also expect to share our finding results with both the reserve administration and the community. The workshop will be held targeting these categories of people.

MAPUTO SPECIAL RESERVE 2020

Left: Some communities settling in the reserve. Right: Road field situation during the field work.

Left: Field measurement during data collection. Right: Field data collection in Reserve.