# 1. Executive Summary

**ES:1** The Evaluation study on Human Elephant conflict, the mitigation methods employed and its impact on conflict resolution was assigned to TECSOK by Karnataka Evaluation Authority. The period of study was pertaining to the measures taken during 2014-15 to 2018-19 in the five elephant habitat districts of Ramanagara, Mandya, Mysuru, Chamarajanagar and Kodagu. The purpose of the study is mainly to evaluate the various measures taken to reduce the human elephant conflict (HEC) and to arrive at the most efficient measure with cost effective. With the HEC assuming alarming proportions in the recent past and considerable amount is incurred in erecting physical barriers in the form of barricades to manage the conflict and also payment of ex gratia for crop, property damages and injuries and death of humans. On the other side death of elephants is also a matter of concern. The genesis of the conflict is mainly due to changes in the landscape resulting in fragmentation and shrinking of elephant habitats and at the same time increase in the elephant population.

**ES:2** The purpose of the study comprises of mapping the details of physical barriers erected during the study period and classify them into different categories and combinations and evaluate their physical status and effectiveness. With increase in HEC resulting in increased expenditure on erecting the barricades, the cost benefit analysis of these barricades also needs to be looked into. The primary indicators of the severity of conflict are the damages occurring to crops and properties of farmers, injuries and deaths of humans due to conflicts. The pattern of these raids, seasonality, frequency, stages of the crop raids, assessment of extent of damages, payment of ex gratia and gaps in the process are studied and presented. With the level of vulnerability and risk due to conflicts is varying in these areas, mapping them according to different levels will help in taking precautionary and forewarning measures to reduce the conflict. These various measures adopted should ultimately result in reducing the HEC and bring it under managing levels. Evaluation methodology comprised of collecting primary data on sampling basis (10 %) of the barricades constructed during the study period on its

physical status and classifying them into different categories. With a total of 5037 km of barricades constructed during the period across all types of barricades, about 503 km length of sample size was taken up. The sample barricades were selected through stratified random sampling in sample villages. Sample villages were selected (10%) from the listed population (villages) with each village having at least one crop raid. About 128 villages were selected for sampling to collect data on location of villages with respect to forest boundaries, crop raids, seasonality, time, extent of damage, amount of ex gratia paid, adequacy of amount and gaps in the process of payment. Data from 854 affected farmers were collected across the study area. Collecting data from KFD, literature survey from other states comprised the secondary source of data for the report.

**ES: 3** The landscape of the study area has been categorised into three, with areas of Ramanagara, Mandya, Mysuru and Hunusur having flat terrain and fragmented forests and diffused forest boundaries, interspersed with agriculture and habitation. The second category being, flat and plain terrain with continuous forests and hard boundaries as seen in Chamarajanagar, Bandipur and Nagarahole. The third category of areas in Kodagu is hilly and undulating terrain with forests and plantation crops like coffee, pepper and cardamom. This classification will help in analysing problems of HEC which are common and also arriving at uniform recommendations as to the measures to reduce and manage the conflict.

**ES:4** Data on status of barricades shows that most of the EPT in Ramanagara district, Mysuru, Chamarajanagar and Madikeri (T) was categorized as poor (more than 50 % damaged) to moderate and many of them are not maintained. In Bandipur and Nagarahole, EPT's are in functional status with most of it falling under good and moderate category. Some of the EPT's which are constructed during 2014-15 are not maintained due to non-receipt or no provision of funds, are invariably abandoned after few years due to accumulation of silt, rubbles and weeds growing rendering the whole exercise futile. Solar fence constructed in the study area has been functional except in few cases, where it is constructed in earlier years (2014-15) and not maintained as observed in Ramanagara. In Mysuru, Chamarajanagar, Bandipur, Nagarahole and

Virajpete they are well maintained and functional. Considering that EPT or solar fencing cannot be standalone in reducing the conflict, combination of solar and EPT have given good results and are found to be more effective compared to either of the two independently. In Mysuru, Bandipur and Nagarahole combination of solar and EPT have given good results. Combination of solar tentacle with Rail fence in Nagarahole has good deterrence abilities. The overall working of these EPTs in the study area is not satisfactory as most of them lack maintenance. Solar fence both ground and tentacle appear to be effective and optimises cost wherever they are maintained. Rail fence as a barricade is effective and has considerably reduced the conflict in site specific areas. But cost and its limitation of usage in specific sites and some technical issues needs to be addressed. It is inferred that compact forest with continuous hard boundaries with barricades, have reduced conflict compared to mosaic pattern of forests and agriculture areas where boundaries are also diffused.

**ES:5** Data on correlation of barricades and number of crop raid cases though do not indicate any clear trend, declining crop raid cases are seen in Nagarahole with its 265 km length of barricades. Cases being high in Ramanagara, Mysuru and Virajpete with barricades ranging from 9 to 40 km length indicates less barricades constructed during the study period, In such cases barricading fragmented patches could be an unviable option. In such scenario farmers have resorted to solar fence barricades for their farms with fairly successful outcome. All these barriers need regular maintenance and monitoring which has to be systematically taken up rather than adhoc approach and also before erecting new barricades.

**ES:6** Data on crop raids and ex gratia payment was collected in about 128 villages and 854 farmers were interviewed. Villages located in proximity to forest boundaries of less than one km and on the fringes have high percentage of crop raids as seen in Chamarajanagar, Hunusur, Madikeri and Nagarahole. As the distance increases beyond 1 km there is a decreasing trend in the percentage of raids and exception to this observation is Ramanagara, Mysuru, Mandya where proximity of villages does not matter, as far as percentage of raids are concerned as forests are interspersed with agriculture in these areas. In case of Madikeri and Virajpete the villages which are

located beyond 1 km from forest boundary also had high percentage of crop raids (62-68%) probably due to the physiography of the area and the villages might have been spread out. Most of the crop raids takes place during night times and forewarning and adequate precautions need to be taken to prevent the raid and drive the elephants. Damages due to crop raid occur not only due to feeding on the crops but also due to movement and trampling in the area and often rendering it unfit for use. Generally small and marginal farmers whose holdings are less than one acre (about 55 % damaged) who grow field crops like Ragi, maize, Paddy, Jowar and pulses are the worst hit. Most of the crop raids takes place during the months between September to March. This period coincides with the post monsoon when most of the field crops attain maturity. This is the period when adequate early warning and precautions need to be taken to prevent the damage to crop and property. It is observed that though there is no preference for type of crop, often food crops at maturity are targeted and the fringe villages are often the worst hit.

**ES:7** Ex gratia payment involves the total amount to be paid for the damages and the time of disbursement. The crop damage cases and ex gratia is mainly seen as an effect of the HEC. The conflict has already damaged and whatever compensation is being made is mainly supportive in nature, the economic loss and the emotional factor cannot be fully compensated. The affected farmers have generally expressed that the ex-gratia amount is inadequate and not commensurate with the actual loss. Many farmers are of the opinion that there has been delay in receipt of the ex-gratia ranging from 3 months to a year. However, these short comings have been taken care by the Department and Government with the introduction of e- Parihar and also setting aside funds exclusively for payment of ex gratia outside the purview of plan allocation. On the basis of number of crop raid cases and the amount of ex gratia paid, the severity of conflict is categorised in to high, moderate and low. Villages around Ramanagara, Virajpete, Madikeri(T) and Bandipur have been categorised as High-risk areas. Mysuru, Chamarajanagar, Nagarahole and Madikeri (WL) are categorised as moderate risk areas. Villages around Hunusur and Mandya are put under low-risk areas. This category helps in prioritising areas and plan adequate measures to reduce and manage the conflict.

**ES:8** Community involvement needs to be ensured at every stage beginning from selection of site for barricades. Several complementary measures such as guarding or night watch, fire, drum beating, crackers are used to drive the elephants. However, it is important that forewarning and communication plays a role in reducing the damages before it occurs. FD should take the initiative of forming a network with selected people (youth) from the villages and form a network of communication for early warning of elephant and possible raids. This communication network and putting it in place will go a long way in preventing the conflict and reducing the losses eventually.

**ES:9** Farmers expressed that Solar fence is an effective barricade and the combination of EPT and Solar fence is the best combined barricades. They also opined that maintenance of these barricades is important for its effectiveness. Many of the farmers have agreed that there is a need to discourage growing crops like banana which attract elephants. But they are not interested in changing their cropping patterns and in many cases provision for buffer cropping is not a viable option.

**ES:10** Many of the field personnel of the department expressed that there is a need to set up a full fledged Anti Depredation Squad (ADS) or revive it in all areas where HEC is there. They should be provided with vehicles; man powers and has to be exclusively engaged in preventing and managing the HEC. Providing surveillance drones and other related equipment for better monitoring of elephant herd movement is necessary.

**ES:11** From the data available on projection of physical and financial outlay there is an increased projection both in terms of physical targets and the financial expenditure. It is observed that Madikeri territorial and Wildlife divisions both have increased projection of financial requirements in the coming years, indicating need for more barricades and probable increased level of conflict. Madikeri Division has projected considerable increase in their projection from Rs.32.9 lakhs to Rs.3399 lakhs and so also the physical targets projected. Bandipur and Nagarahole also have projected increased financial outlay and the physical targets projected in the coming years. These outlays indicate that barricades are being taken up in a phased manner to cover the boundaries.