

## Employ Innovation, Technology and Cooperation to Reduce Collisions between Vehicles and Wildlife

Adi Gamliel, VP, Innovation, Strategy and ESG and Netivei Israel – National Transport Infrastructure Company, Israel

Illustrations © Netivei Israel

**T**he budget for transportation infrastructure development in most of the world is huge: upgrading of junctions, expansion of roads, building new high-speed train tracks are an integral part of expanding the connectivity between different countries, increasing the movement of goods and freight, and putting in place trade agreements.



Adi Gamliel

Countries build thousands of kilometers of roads every year in order to support these activities as part of their economic vision. The greater the connectivity and efficiency of the transportation network, the more Gross Domestic Product (GDP) and other economic indexes grow.

For the most part, public officials and entities prefer to downplay or ignore the ecological impact of roads and for many reasons try to justify the establishment of transportation infrastructure, logging and the impact on biodiversity in each country as part of reducing open spaces, forestry areas and managing habitats for animals in general and wildlife in particular. The effects of different types of roads vary, also depending on their size and the geographical location in which they are focused. But for everyone, the net impact is complex and problematic.



Illustration 1 - Numbian Ibex, Southern desert-dwelling species in Israel

Today, there is increasing awareness throughout the world of the importance of preventing wildlife accidents. The increasing preoccupation of the global media with human impact on biodiversity and with climate change has raised awareness among decision makers. Material analysis of companies engaged in transportation infrastructure requires that we deal with these issues. United Nations Sustainable Development Goals enable a platform for cooperation between government bodies and international institutions. For example, achieving targets of Goal 3.6 claims special attention to reduction of traffic accidents with animals. Other examples are Goal 15.5 includes taking urgent and meaningful actions to reduce damage to natural habitats or Goal 17.16 which deals with strengthening the Global Partnership for Sustainable Development and is complemented by partnerships between many stakeholders who transfer and share

information, expertise, technologies and financial resources, in order to support the achievements of the Sustainable Development Goals in all countries.

### DEFINING THE CHALLENGE

The encounter of wild animals with vehicles on intercity roads often leads to road accidents and poses a significant risk to road safety; the risk to both road users and wildlife is great. This risk is reinforced when we see that some of the species involved are endangered species. The impact of climate change on roadside ecosystems makes the challenge even greater and requires thinking about ecological corridors in a more serious and systemic way

The biggest threat to wildlife comes from vehicles speeding on highways, or from drivers being unaware of the problem and thus driving incautiously on roads where there is a risk of wildlife accidents despite roadside signs warning drivers of the presence of wildlife. Just as an increase in traffic leads to more collisions on any given road, so too there is an increase in roadkill. Not only mammalian wildlife is affected, so too are reptiles, amphibians, invertebrates and birds. Snakes are particularly vulnerable because they are attracted to the hot asphalt. And what about the thousands of insects that crash against car windows? None of these are counted since there are not many infrastructure companies that collect this data. Usually, if people aren't injured in a car accident

because a snake or other small animal is run over, it is not reported.

### A DANGEROUS ENCOUNTER ON ISRAEL'S ROADS

Many in-depth studies of the behavior of wildlife on Israel's roads have been carried out over the years. However, a wide variety of species can be found in Israel and those in the north of the country do not behave identically to those in the arid desert in the south adjacent to the border with Egypt, or to wildlife in the Jerusalem area or along Israel's eastern border with Jordan or its northeastern border with Syria. There is a great difference in the way animals behave on and near roads. The challenges along Route 90 in Israel where it traverses the Dead Sea are great because there, in search of food, the Israeli gazelle comes down from the mountains to the road. Some have become used to the roads and to vehicle traffic, and from here the path to accidents that endanger road users and the gazelles alike is a short one.

Nineteen ibexes were run over and killed in a six month period on Route 90, in the northern part of the Dead Sea. This happened in the first half of 2022 and this is a dramatic increase compared to previous years. In 2021, seven ibexes were run over in the same area and in 2020 only two. One of the reasons is that the desert in the area received almost no rain. The ibexes had nothing to eat up on the cliffs and had to head down and cross the road to the palm groves, farmland and vegetation. When there is no vegetation in the desert, ibexes – especially populations accustomed to the presence of humans – approach the road to access the vegetation on its edges. These are the same ibexes that enter nearby communities in search of food. Beyond any doubt, we are seeing the impact of climate change on the migration of animals, especially wildlife, seeking food and water.

In autumn, there is another factor that impacts the behaviors of the ibexes in the Judean Desert, the Negev and the small population in the Golan Heights – the mating season. Every morning, the ibexes descend from the Dead Sea cliffs to the grazing areas by the streams. They drink there and, in the heat, they rest in the shade; in the evening they return to their hiding places in the cliffs. During the mating season, ibexes gather in large groups and the males court the females within the group. The females are still with the young ibex kids from the previous years, while the males, especially the young bachelors, chase them all around. The older males are busy fighting among themselves and soon they will mate, which guarantees that next year there will be more ibex kids.

In recent decades, the situation has also changed in light of the significant increase in infrastructure development and the expansion of cities and communities, and also as a result of changes in the amount of agricultural land cultivated in Israel. As open spaces shrink, the number of encounters between wildlife and vehicles has grown significantly. This

is a good enough reason to further investigate the impact of the changing landscape on the prevalence of wildlife-vehicle collisions and how this can be quantified while finding technological solutions to eradicate the phenomenon.

### WILDLIFE IN URBAN AREAS – HAIFA AS A CASE STUDY

Humans constantly require new roads for connectivity, forcing wildlife to move ever closer to these roads and to human settlement, so even new animal crossings do little to save wildlife. In recent years, the wild boar has become an invasive species, a species that has grown in numbers due to human activity. The wild boar population is growing at a relatively high rate. As a result, there has been more evidence of encounters between humans and wild boars within urban areas. Until 2006, there was a harmonious equilibrium between the residents of neighborhoods in the northern Israeli city of Haifa near the Carmel Mountains and wild boars, and a head-on encounter with a wild boar was considered a rare event. In 2006, wild boars were observed entering these neighborhoods. Reports of damages caused by the wild boars began to appear and there were reports of attacks by the boars on residents and their pets.

The expansion of the wild boar population and their move into urban areas can be explained mainly by increased availability of food in urban and agricultural areas. People feed the boars, and household garbage and agricultural crops are easily and readily available to them. The wild boar is omnivorous, but its diet is mainly based on plant material (about 90%) such as roots, acorns, nuts, green plant materials and agricultural crops. The rest of their diet consists of a variety of fungi and species such as worms, snails, arthropods, fish, birds and small mammals, as well as bird eggs and carcasses. All of these can be found, sometimes in abundance, in urban environments. In addition, water is a necessary resource for the survival of wild boars, and thus they roam in search of water during the dry seasons.

Another factor in the growth of the wild boar population is their unique reproductive abilities along with their ability to invade different environments and their opportunistic food habits. Further factors are an increase in human encounters, the lack of natural predators of wild boars, the urbanization of natural habitats, and the proliferation of shelters at the edge of farmland. Researchers have found that wild boars in open areas (agricultural areas and nature reserves) are far more apprehensive about human contact than urban wild boars. Lower apprehension among wild boars in urban areas is probably due to their habituation to the presence of humans.

In 2012, the authorities began regular dilution of the wild boar population, along with additional measures. Between 2014 and 2018, dilution activities doubled, but failed to achieve the desired goal of diluting 50-60% of the wild boar population. In 2013, the average number of complaints

made by neighborhood residents to the municipal hotline about wild boars was about 1,500 a year, or around four complaints per day. In 2018, the Haifa Municipality estimated the number of wild boars in the city in the hundreds, but some claim that this is in fact lower than the real number. It has also invested NIS 600,000 in attempts to reduce the number of wild boars invading their city's neighborhoods.

In 2019, the municipality moved to take humane measures, both because dilution failed to achieve the desired results, as already stated, and due to the ideology of the city's new mayor. In January 2020, the Haifa Municipality put up road signs in the Carmel neighborhoods warning of the presence of wildlife in the urban environment. The prominent yellow road signs carry an illustration of a wild boar and the inscription "Haifa wild boar nearby." In addition, the municipality has begun fencing off areas, installing cat-only feeding stations and garbage bins that cannot be knocked over in order to make it difficult for the wild boars to access food. This issue has received broad exposure and was one of the main issues in recent mayoral elections in the city and is expected to play a major role in the October 2023 municipal elections.

## SAFETY FOR ROAD USERS

Collisions between vehicles and wildlife often cause serious injury and even the death of both animals and humans. Accidents involving animals such as a camels, cow or wild boar can be disastrous for both sides. The picture is worse when accidents involve two-wheelers such as motorcycles, and injury to humans can be more significant since the rider has no protective frame (*illustration 2*).

In order to increase the safety of road users in traffic and at work, Netivei Israel - National Transport Infrastructure Company is working in a wide number of directions, starting with traffic arrangements at work sites. First of all, it is important to understand



*Illustration 2 - Desert-dwelling goats near Road 90, Ein Gedi.*

that the behavior of drivers is influenced by awareness of the issue and its scope. The greater the awareness of the problem of collisions with animals, the likelier it is that drivers will adjust their driving correspondingly. There is evidence that the number of accidents involving animals on roads where signs warning of the presence of wildlife are prominently placed, along with the use of reflectors, declines at least temporarily. A proper road sign that includes reflectors makes it possible to influence the behavior of road users and leads to greater safety.

Being alert at all times while driving can reduce the risk of harm to wildlife on our roads. The chances of avoiding an accident improve when a driver sees in good time that an animal is blocking the road and is able to respond accordingly. Drivers should not stray from their lane to avoid hitting an animal, but should try to slow down or stop safely if possible. Making calls with a hands-free device may be legal, but using a phone is still a distraction. Reducing phone use in general and in particular in areas where animals may be crossing can help a lot in reducing the phenomenon of collisions with animals. Drivers should be aware that that in most cases animals to be most active at dawn and in the evening, so drivers may benefit from being more alert during these times. Also, animals often band together and move as a herd. So, if you see one, there are likely to be many others. However, while no one wants to kill or injure an animal, the life and safety of the driver is more valuable than that of an animal. If a collision is unavoidable, the driver should slow down as much as possible and do what is possible to minimize injury. In any event, following a collision with a large animal, drivers and passengers should stay inside the vehicle as injured animals can be very dangerous.

## INNOVATION AND R&D

To my great delight, I have the privilege of heading the Innovation, Strategy and ESG Division at Netivei Israel – National Transport Infrastructure Company, which is developing a variety of solutions to deal with the challenge of preventing collisions between vehicles and animals based on the understanding that the way to deal with these challenges lies in creating space for cooperation between the relevant parties, including government institutions, nonprofits, and technology companies. Declaring the issue a national challenge enables the ecosystem to understand the directions that interest us as a national company engaged in transportation infrastructure and to see where we are willing to invest our budgets. This raises awareness and helps develop solutions that enable us to cope better. Fortunately, the Innovation, Strategy and ESG Division is

comprised of branches ranging from research and development, innovation, transportation models, strategy, ESG and the Chief Scientist, enabling us to ensure that we are best prepared for future existing challenges.

### TECHNOLOGY AND DATA COLLECTION AND ANALYSIS

Just like in any field, if you don't measure, you can't manage, and if you're not a manager, you'll never be able to change things. Managing the data of carcasses lying on the sides of the roads that the company is responsible for can serve as a good basis for understanding the danger on each of these roads. To this end, the Israel Nature and Parks Authority established a system for managing data collection along with the Netivei Israel patrol units which photograph carcasses as they are removed. Full documentation of this data makes it possible to analyze the data in an efficient manner in order to understand the movement of animals in every geographical region and on every road in Israel. Over time, data collection and management make it possible to take a sober look at the phenomenon and try to deal with it in a number of ways, including the day-to-day maintenance of the road network but also in the early stages of future planning when the need to expand and develop future transportation infrastructures such as railways, roads or interchanges is brought up.

Below is a graph of reports on the removal of wildlife carcasses from Israel's intercity roads. The graph is broken down by months and years; measurement began in August 2010 and the graph shows the data for 2023 until the end of July (*illustration 3*).

Analyzing the results of the graph makes it possible to understand the phenomenon in a clearer way. The graph gives us tools to help raise awareness among road users in the months in which statistics show that there is an increase in the number of vehicle-animal collisions. Furthermore, the data collected by Netivei Israel

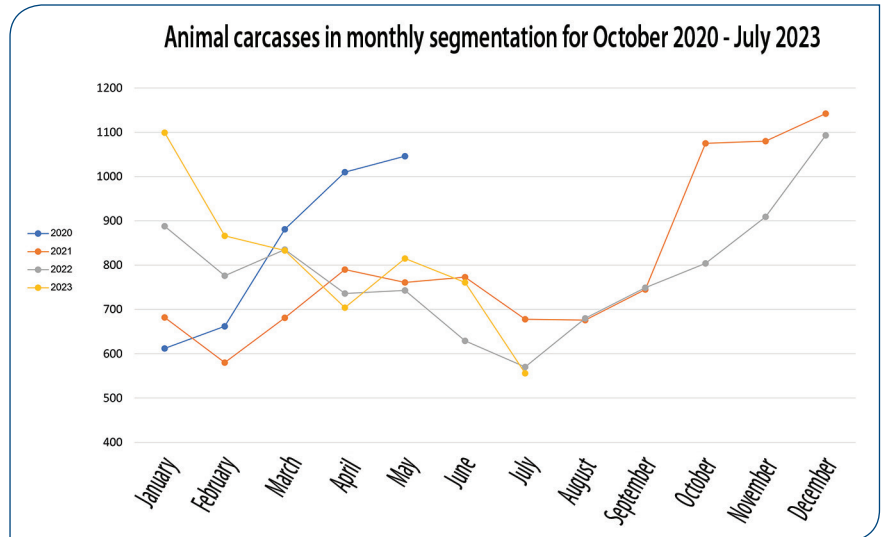


Illustration 3 - Data from the Bina - Netivei Israel road maintenance Information system

shows that from August 2020 to July 2023, there were some 28,895 accidents involving animals -- 15% of them on a one-digit main road (roads that serve as main transportation), 42% on two-digit main roads (high-traffic roads) and three-digit regional roads, and some 12% on four-digit local roads. Optimization of the data by location along the roads, analyzing the incidents according to road numbers, and consulting with ecologists from the Nature and Parks Authority in Israel gives us a better understanding of the causes of accidents and thus also enables us to deal with these causes in the most efficient and effective way, to save people and animals, and to preserve Israel's unique biodiversity.

### COLLABORATION IS THE WAY TO SUCCEED

Cooperation is the best way to deal with complex challenges. There are no magic solutions and there is also no one right way. The tighter cooperation is, the greater the desire to change reality and create something new. When egos are put aside, each party brings different abilities and results are much better.

In cooperation with the Nature and Parks Authority, we examined the possibilities of using technology to reduce the extent of damage caused when cars hit wildlife. We plan to deploy shortly pilots of advanced systems at hotspots across the country that are known to be popular crossing points for wildlife. One of the pilot programs will test a technology being developed by an Austrian company, IPTE: Small poles are placed on the side of the road, When a vehicle approaches, a sonic wave is created that passes between the poles at a frequency that only animals can hear. They are deterred by this sound and it prevents them from crossing the road.

### A CALL FOR RESEARCH PROPOSALS

Netivei Israel is calling for research proposals on smart transportation, safety and transportation infrastructure. In cooperation with the Ministry of Science and Innovation and the Ministry of Transport, we seek to promote applied research activities in academia and research institutes in order to apply them nationwide. This move is likely to contribute to Israel's competitiveness and place it at the forefront of global knowledge and research in this field. At the same time, we understand our national responsibility at Netivei Israel as the body responsible for the planning, development and maintenance of the inter-city road network, as well as the development of railways across the country.

To fulfill our responsibilities and maintain our role as leaders in these fields, we promote multidisciplinary, innovative, and applied academic research in cooperation with expert communities in Israel and around the world, in order to formulate advanced solutions at the forefront of knowledge in development, maintenance and management of traffic. This year, the Ministry is also cooperating with the Road Safety Authority and is incorporating in call for road safety research proposals a call for researchers to submit proposals for research in the field of road safety with monetary support to the tune of millions of shekels.

In Israel, as in the rest of the world, infrastructure development receives great attention from governments and international organizations such as the World Bank. For better

or worse, animals in general and wildlife in particular do not have passports, and no one notices when they pass between cities or countries. Therefore, this thinking and a systemic view of this kind requires all government institutions dealing with infrastructure in general and transportation in particular to cooperate and collaborate, and to forge a comprehensive vision to protect wildlife in encounters with roads and railways. We must work together to promote joint research, pool resources, and promote startups that will develop technologies to deal with these challenges. The deeper our cooperation, the more it will be possible to positively impact ecosystems and preserve biodiversity on Earth. He who runs fastest runs alone, but if we want to run far, we must do so together (*illustration 4*).#



*Illustration 4 - Camels on roads in Israel*