NATIONAL REPORT SLOVENIA

PREPARED BY:

STANISLAV AVSEC

DAVID RIHTARŠIČ

VERONIKA ŠULIGOJ

ŠPELA HRAST

UNIVERSITY OF LJUBLJANA

INTRODUCTION

The Green Economy is Slovenian long-term strategic direction and represents an opportunity for the development of new green technologies, the opening up of green jobs, more efficient management of natural resources, the promotion and development of Slovenian knowledge. It is an opportunity for the growth of the economy and for strengthening international competitiveness, while reducing the environmental risks that negatively affect the quality of life and human well-being (Government of the Republic of Slovenia, 2019).

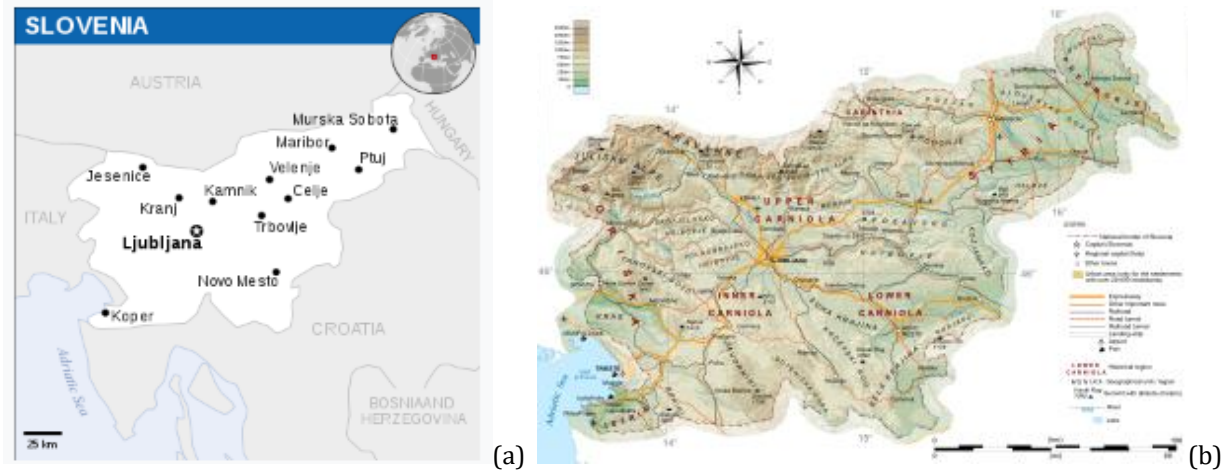
PHYSICAL CONTEXT AND GEOGRAPHY

Slovenia, with its position on the Strait of the Alps and the northernmost bay of the Mediterranean Sea, represents one of the most important European transitions from south-eastern Europe to the east (Figure 1). Slovenia is characterized by a large landscape diversity, which is a consequence of the interaction of various climatic and geomorphological characteristics of the Alpine, Mediterranean and Pannonian world, and of various cultural influences. Slovenia lies at the junction of two international transport corridors, and the port in Koper is an important national and international freight transport hub and seaport due to its geostrategic position. Among the natural features, the most important are its forestation, wateriness and the preservation of watercourses, karst characteristics and karst phenomena, as well as biodiversity and landscape diversity.

Slovenia is extremely rich in water, it is one of the smallest countries in Europe, but it has a high quality surface water, which is maintained and improved in terms of water resources among the richest. Forests that cover 60% of all areas are an important natural resource, and Slovenia also has a lot of preserved natural areas and geothermal springs, where it develops various forms of tourism. Natural resources represent a great advantage for the transition to renewable energy sources, the efficient use of resources, the development of green services and jobs. Many Slovenian companies have already developed new solutions to their production processes, which are examples of good practices of green companies and the transition to circular production models. In

Slovenia, we have a lot of knowledge and a number of highly developed solutions in the field of technologies (energy efficient construction, cooling and heating, materials ...), innovations in the field of waste processing into targeted uses (insulation materials), innovation in the field of smart services. We must actively support further development of these advantages, both in the direction of marketing know-how and innovation, and in the direction of upgrading technologies, processes, digital solutions and services. Slovenia's focus on the green economy, with the goal of deliberate use of natural resources, improving energy efficiency and process efficiency, and moving from linear to circular models of the economy, strengthens our competitiveness.

Slovenia is a country located in southern Central Europe at a crossroads of important European cultural and trade routes. It is bordered by Italy to the west, Austria to the north, Hungary to the northeast, Croatia to the southeast, and the Adriatic Sea to the southwest. It covers 20,273 square kilometers (7,827 sq mi) and has a population of 2.07 million. One of the successor states of the former Yugoslavia, Slovenia is a parliamentary republic and a member of the United Nations, of the European Union, and of NATO. The capital and largest city is Ljubljana (Wikipedia, 2019).



(a) (b)

Figure 1: Slovenia in a world scale (a), and a topographic map (b) (Wikipedia, 2019).

Slovenia has a mostly mountainous terrain with a mainly continental climate, with the exception of the Slovene Littoral, which has a sub-Mediterranean climate, and of the northwest, which has an Alpine climate. Additionally, the Dinaric Alps and the Pannonian Plain meet on the territory of Slovenia. The country, marked by a significant biological diversity, is one of the most water-rich in Europe, with a dense river network, a rich

aquifer system, and significant karst underground watercourses. Over half of the territory is covered by forest. The human settlement of Slovenia is dispersed and uneven.

Slovenia has a developed economy and is per capita the richest of the Slavic countries by nominal GDP. Slovenia was in the beginning of 2007 the first new member to introduce the euro as its currency, replacing the tolar. Since 2010, it has been member of the Organisation for Economic Co-operation and Development. There is a big difference in prosperity between the various regions. The economically wealthiest regions are the Central Slovenia region which includes the capital Ljubljana and the western Slovenian regions, as Goriška and Coastal–Karst, while the least wealthy regions are the Mura, the Central Sava and the Littoral–Inner Carniola.

Considering benchmarking competetivness of national economy in the fourth industrial revolution, Slovenia has performed as 35th out of 140 economies (Figure 2).

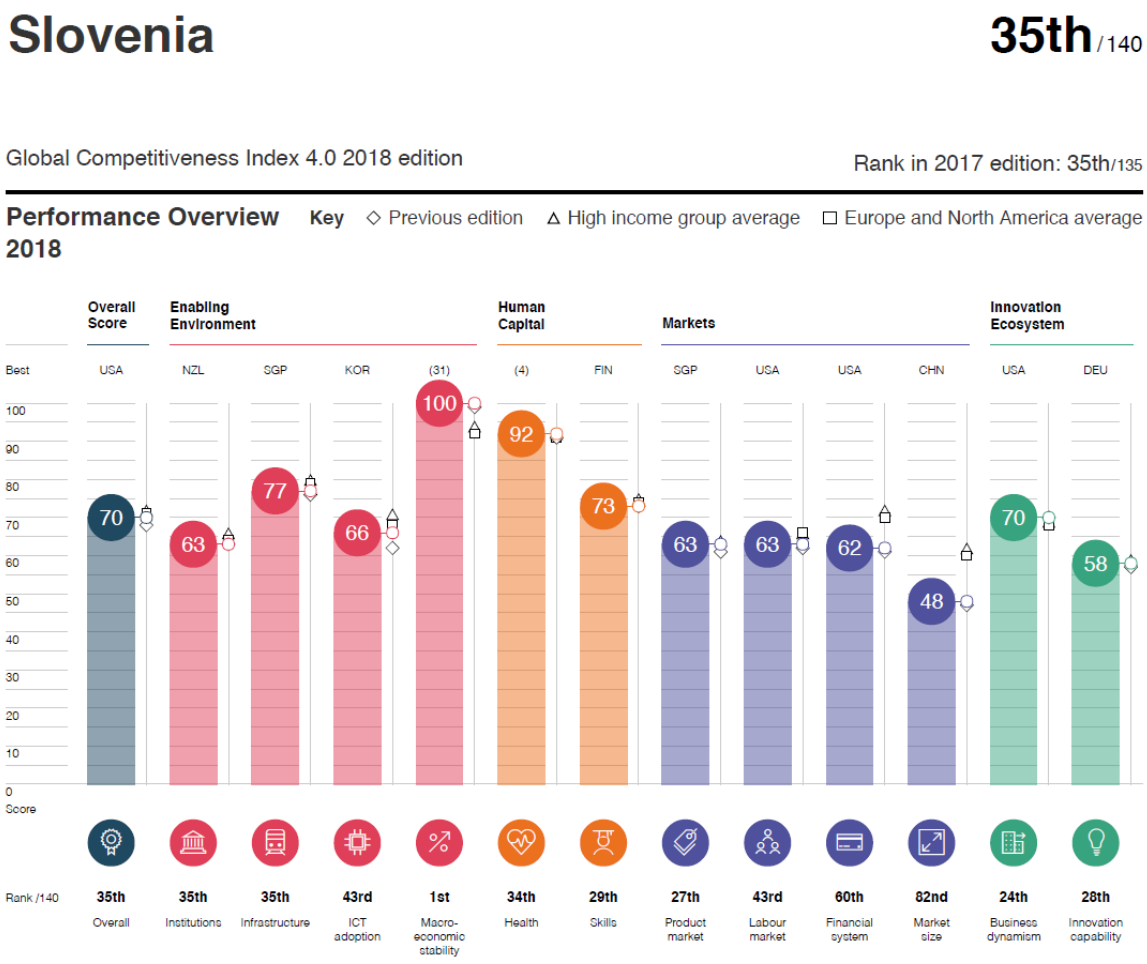


Figure 2: Slovenian performance overwiev in year 2018. (WEF, 2018)

1.CURRENTLY EMPLOYED GREEN LOGISTIC SYSTEMS

The World Economic Forum identified eight megatrends in logistics that will change logistic activity in the future (WEF, 2018). The megatrend of a logistic system is always and everywhere the same, i.e. prepare people to implement the flows of logistics objects, i.e. rationally and effectively. These megatrends are: globalisation and transport, indivualisation of society, individualisation of society and impact on transport, ICT, ICT and transport, enviroment protection, enviroment protection and transport, and terorism and criminal in transportation. Demographic changes, urbanization and changed demand will have a major impact on the management of logistics processes and systems. Technological development will require adaptation and a modified way of thinking. There will be a need for more cooperation and integration between supply providers and the value chains, as the biggest losses are here, for example, when 50 percent of lorries go empty after delivery. The aforementioned forum notes that there will be a lack of logistical competencies, and the training of future competent logistics with an interdisciplinary knowledge is even more important. The demands of end consumers have a huge impact on the development of business and technological trends. According to forecasts, the world population is expected to reach 9 billion people by 2050, of which two thirds are expected to live in cities. The middle class is also expanding, expanding internet access and increasing e-consumption. All this will affect logistics providers. Delivery to remote locations or in the city center, and at the request of 'deliver today, since I have ordered today, that is, I need today', it will require adaptation and is inevitable.

1.a Current Situation of LOGISTICS in Slovenia

Logistics is still one of the fastest growing industries. With the advent of digitization, it begins complex transformation. Logistics is the backbone of every industry, primarily by retail and e-commerce silita, to change and adapt. Needs the modern consumer has changed so much, that satisfying them requires complete adjustment of logistics. Because consumers are increasingly using digital services and internet platforms (eBay, Amazon, Alibaba oz. Aliexpress), they expect to receive the same quality and flexibility of services in others industries. For logistics companies it is no longer enough to they deliver the shipment in time, now they have to offer multiplatform service to both personal and business customers. It is expecetd that industry-related business

trends to change logistics. Logistics 4.0 and the Internet of Things, the development of blockchain technologies that creates new business models, and the need for sustainable logistics (Hribar Milič, 2018).

There are many technologically advanced companies in Slovenia that understand the importance of adapting to changing market demands. Connectivity and integration will surely play a key role, without a smartphone, today it's practically impossible to live, so it will play an even more important role in the future in terms of B2C and B2B.

Demand is increasing, there are many investments. Only in Slovenia can we see an increase in new funds. Some companies will also cover Europe in a wider, and not only Slovenia, from these stores. Investments are taking place in the area of logistics infrastructure, car parks and, of course, investments in optimization and energy improvements. Outsourcing is certainly a logical move, as logistics companies can be much more effective than if they are done by the producers themselves.

More and more important visibility is in logistics. Until recently, it is sufficient to know where the unit is traveling and where, but today, to increase the efficiency of operations, this is no longer sufficient, warn the independent and non-profit organization GS1 Slovenia. This is the status of the transport unit in the chain, highlighting the importance of applying the GS1 EPCIS system standards (GS1 Slovenija, 2019).

GS1 points out that the optimization of logistics in Slovenia is a huge reserve. "The processes are not optimized. Each article in the chain works in its own way, there are not enough connections and data exchanges, and solutions are mostly made at the level of individual companies. They pay attention also to digitization, since through the digitization of supply chains, all partners will be mutually harmonious, speaking the same language, which will enable greater clarity and rationality of operations, and consequently, there will be no mistakes.

In recent years, we have seen major changes in the area of passenger transport, especially when connecting passengers' wishes with lines and selling methods. To meet modern trends, sales must be digitized, properly targeted and constantly adapted to market requirements. As far as transport means are concerned, it is particularly noticeableorientation to electrification, which can only be a short-term solution.

In the transport business, financial statements of operations for 2017 were submitted to AJPES by 7,586 commercially active entities, among them 3,417 companies, 4,165 small sole traders and 4 cooperatives. All transport activity operators are,

compared to all entities in Slovenia, employed 7.7% of all employees, generated 5.7% of all net sales revenues, recorded 10.9% of all assets and generated 9.1% added value (AJPES, 2019).

The net revenues of all transport operators increased by 11.2 percent to EUR 5.510 million in 2017, which was a historic record. In the eleven years, net income of EUR 4,374 million was recorded on average. Net corporate income grew by 12 percent (86 percent of all), while sole traders increased by 3.8 percent (Figure 3).

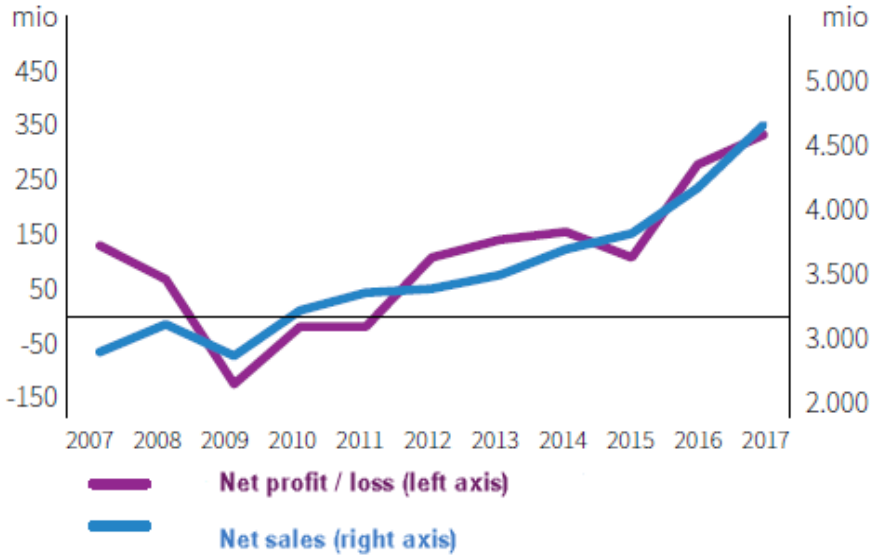


Figure 3: Sustainabale growth of transport (AJPES, 2019).

The structure of companies in the transport sector shows the dominance of road freight transport, accounting for 42.9% of the net earnings generated, 70.2% by number of companies and 42.9% by number of employees. The net profit is dominated by logistics, which generated 44.3 percent of the total profits of transport companies, followed by road freight transport with a 24.2 percent share. The second largest activity within transport regrding the sales is logistics with a 42.9% share of all entities, followed by post and courier activities with a 16.6% share.

Added value is strengthened substantially over the last two years - on average by 15 percent per year. In the period 2010-2015 it was around 400 million euros. Last year, companies generated EUR 568 million worth of added value in logistics, which is 213.7 percent more than in 2007. In the eleven-year period, there were 362 million euros of added value. Last year it was 72.4 percent of added value it fell to DARS, to which the value added increased by 15.5 percent, while the other, Intereuropa, represented 4.6 percent of

the added value. Added value per employee has moderately improved since 2012, reaching the bottom in 2009. Added value per employee (productivity) in 2017 amounted to 124 thousand euros, increasing by 8.9 percent (Figure 4). Median value added per employee for companies with annual turnover above € 10 million amounted to € 56.8 thousand, while companies with turnover between € 5 million and € 10 million amounted to € 57.3 thousand, for companies with a turnover between € 1 million and € 5 million EUR 39.5 thousand per employee. Labor costs in value added dropped to the lowest level in the last eleven years (to 24 percent), and it had the biggest impact of DARS (9.7 percent). Interestingly, the median share of major companies (over 10 million annual sales) was 66 percent, while for smaller ones (between 1-5 million euros in realization) it was 63.4 percent.

Figure 4: Added value and number of employees in logistics (AJPES, 2019).

However, according to Logistics Performance Index, which gives insight into the attractiveness of the countries to the investors, Slovenia ranked 57th in 2010 that jumped to 35 th position in 2018.

Table 1: Slovenia logistics performance.

	2007	2010	2012	2014	2016	2018
LPI Rank	37	57	34	38	50	35
LPI Score	3,14	2,87	3,29	3,38	3,18	3,31

Slovenia had poorest performance in year 2010, mostly due to economic crisis in the region and in the global. As small, open and dynimc economy, bussines is much tight with global markets, with focus on West Europe markets. Especially, a huge decline was detected in timeliness, infrastructure, international shipments, logistic competence and customs (The World Bank, 2019).

1.b. Current Situation of GREEN LOGISTICS in Slovenia

Green logistics is one of the key areas covered by sustainable supply chain management and has a major impact on the environmental, social and economic performance of sustainable supply chains. Green logistics ensures that the product is moving upward and downward to a sustainable supply chain with the aim of meeting the customer's expectations, taking into account the minimum global costs, which also take into account the costs of climate change, atmospheric pollution, acoustic pollution, vibrations and road accidents. The goal of green logistics is therefore the implementation of a triple logistic process logistic process and the provision of sustainable economic growth for companies by taking into account and choosing the best compromise between the environmental, social and economic aspects (Jedlinski, 2014). The activities of green logistics involve measuring the environmental impacts of different distribution strategies with the goals of reducing greenhouse gas emissions, reducing the consumption of electrical energy by contributing to activities and reducing and managing waste materials.

Supply chains increasingly determine the benefits of individual products and businesses in developed markets. New technological findings contribute to a significant share, which has brought logistics to a significantly higher level of operation in the global economy. The use of new technologies and increasing interventions in the field require balanced and long-term management of the challenges of environmental conservation. Ecological awareness very quickly acquires meaning, which consequently also influences the further development of logistics and its processes.

New higher environmental standards increase the pressure on carriers, manufacturers, recipients who need to provide recycling of end-of-life products or transport units, etc. The entire logistic process is under the pressure of green thinking, which dictates the creation of comprehensive green logistic platforms. Recourse only to reversible logistics and the use of cleaner driving aggregates in road transport is certainly

not enough to follow the rapid development of green logistics. This is why the challenges for the region of South-Eastern Europe are even greater.

At the early stage of the development of green logistics, the emphasis was mainly on reversible logistics. The modern concept of green logistics does not only include the operation of reversible logistics, but also broadly defines the environmental impacts of the entire logistics process. Two stakeholders must be active in doing so. On the one hand, this is a country or a regional community of states, and on the other hand, it is a logistics company that must integrate the basics of green logistics into its primary activity on the market. Both stakeholder groups need to develop and operate in two key areas of green logistics, namely (Zelena Slovenija, 2019):

- the rational exploitation of waste materials,
- rationalization of logistic processes from the point of view of environmental impact, such as: transport, handling and storage.

The development of green logistics in Slovenia is ahead of other SE Europe countries. Environmental awareness is highlighted at every step. There are important movements from setting up ecological zones, collecting and separating waste, even selling scrap and iron to abroad, etc. Important steps are taken in the operation of reversible logistics. However, there are still challenges to the functioning of other areas that are directly linked to the transport sector. It needs to become more environmentally friendly. The need to increase the use of railways, reduce traffic congestion, optimize transport routes and the efficiency of the transport of people and goods, etc., much will have to be done on electronic transport links in order to gradually introduce intelligent transport systems. Transshipment growth in the port should be used to establish the motorways of the sea. In addition, we are still far from the green transport corridors, since it will be necessary to develop and establish previously mentioned elements of green logistics.

Only the state will invest too little in this field, since it invests primarily in infrastructure, so far to the motorway crossing, and in this decade to rail infrastructure. It is difficult to expect that the resources will be enough for other areas of green logistics, so industry will have to set up and finance too much. For us, the pleasure remains that we are in the region in front of other countries.

Unification of goals and short-term and medium-term activities is a must in SE Europe. This actually calls for the proper arrangement of the area. There are two possibilities in this, namely through the national adoption of the relevant legal

regulations, which are previously harmonized between the countries and in the majority unified, or through the interest of the industry itself. The first way is covered by legal coercion and, as a rule, it is less popular because it is very often sharply and radically interfering with the operation of the transport and logistics processes that have been established. Softer modes such as the introduction of ecological fees, increased utilization and environmental benefits, etc. are much more appropriate. Such measures must be taken by all countries in the region, otherwise there would be difficulties in using certain transport routes, which are otherwise economically more appropriate. Much more important is the interest of the industry. The latter is mainly present in the most developed countries, where companies see a business opportunity to increase their own market share in promoting green logistics. As a rule, people's awareness in such environments is higher and, therefore, more often decide on the products and services of companies that have green logistics included in their business strategy.

In last ten years Slovenia was a part of EU strategy which is based on seven pillars (Beškovnik and Twrdy, 2012): green transport corridors as the main goal, intermodal network optimisation, efficient modal shift and greener operations, motorways of the sea and short sea shipping model, intelligent transport systems and standardised it platforms, standardised transport units and packaging materials, and recycling operations (Figure 5) . According to the new EU programme, including project Super Green started in 2010, green transport corridors were priority developments (Beškovnik and Twrdy, 2012).

Slovenia, and other countries too, faced with several paradoxes in green logistics (Beškovnik and Twrdy, 2012):

- speed and time, which are one of the most important results of logistics activity. Increasing flexibility by reducing the timing of transmission, allows the production systems great savings and less investment;
- costs that companies want to reduce in order to save on time and increase reliability. However, often the cost reduction strategies are often inconsistent with environmental thinking;
- Reliability - companies want to deliver their products or goods in the state as they began to send, that is, without damage or fractures. Interestingly, the logistics industry is increasingly advertising air and road freight transports, which, as is known, are the least environmentally friendly;

- storage -logistic systems of the economy are now operating on the basis of inventory reduction, as the speed and reliability of deliveries eliminate the need for inventory and storage. The inventory is actually transferred to the transport system and is constantly transitory, which means that it contributes to overcrowding and environmental pollution.

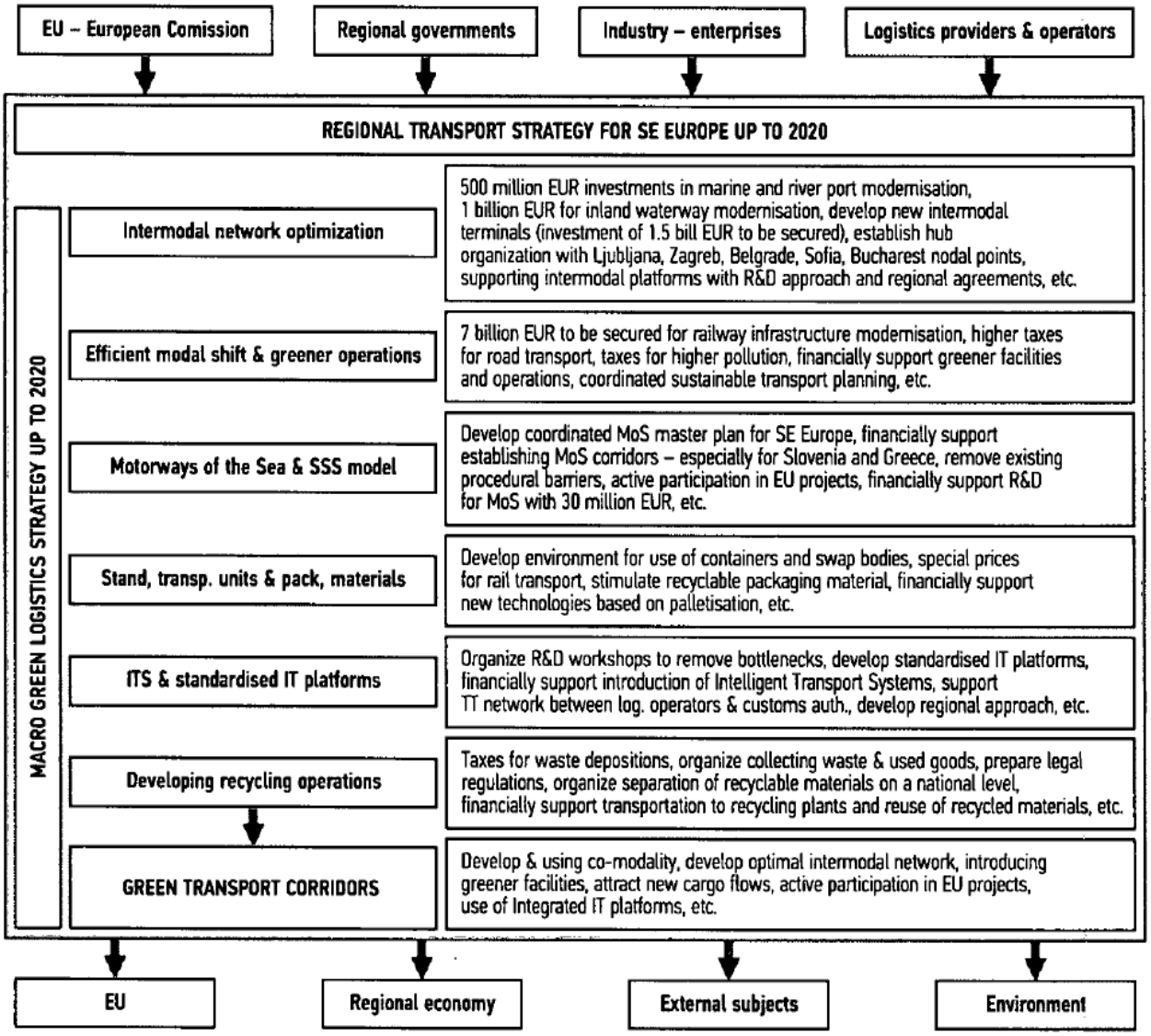


Figure 5: Green logistics strategy for SE Europe (Beškovnik and Twrdy, 2012).

1.1. Green Transport

The region of SE Europe lags behind the developed northern and western part of Europe. The backlog for Western countries is also reflected in logistics and logistics processes. Otherwise, logistics achieves progress and follows the needs of the development of

economies, but it raises the question of whether the principles of green logistics are sufficiently taken into account.

The practice confirms the rapid development of logistics in developing countries in order to achieve economic competitiveness on the global market. There is no emphasis on a "green" concept, or is significantly less present. Thus, older transport and manipulative agents are used, which have lower energy utilization and are at the same time significantly more hostile to the environment. Pollution of the environment with carbon monoxide, hydrocarbon and nitrogen oxide emissions as well as noise is significantly higher compared to strict European standards.

1.1.1. Mode of Transport

An excellent track-record of Slovenian companies in this line of business coupled with modern transport infrastructure is a proven recipe for high-quality and cost-competitive services through Slovenia's road and rail distribution network, freight forwarding and shipping services, goods handling, warehousing, safety of deliveries, maritime and inland logistic terminal operations and range of additional services according to the needs of client. Slovenia's accession to the EU provides both Asian and EU manufacturers and traders with faster and more reliable trade routes that meet at fully equipped logistics centres (Figure 6).

The motorway density in Slovenia is higher than EU-28 average. The links with the neighbouring EU Member States and the southeast Europe is equally good as well. In other words, you will easily reach Slovenia from anywhere in Europe by car or lorry within a day or two. Implementation of the National Motorway Construction Programme began in 1994 when Slovenia had less than 200 km of motorways. According to the Programme 533 km of motorways, expressways and other public roads were built since 1994. The construction and modernisation of the road network will continue and follow the target of 660 kilometres of modern higways, expressways and other public roads.

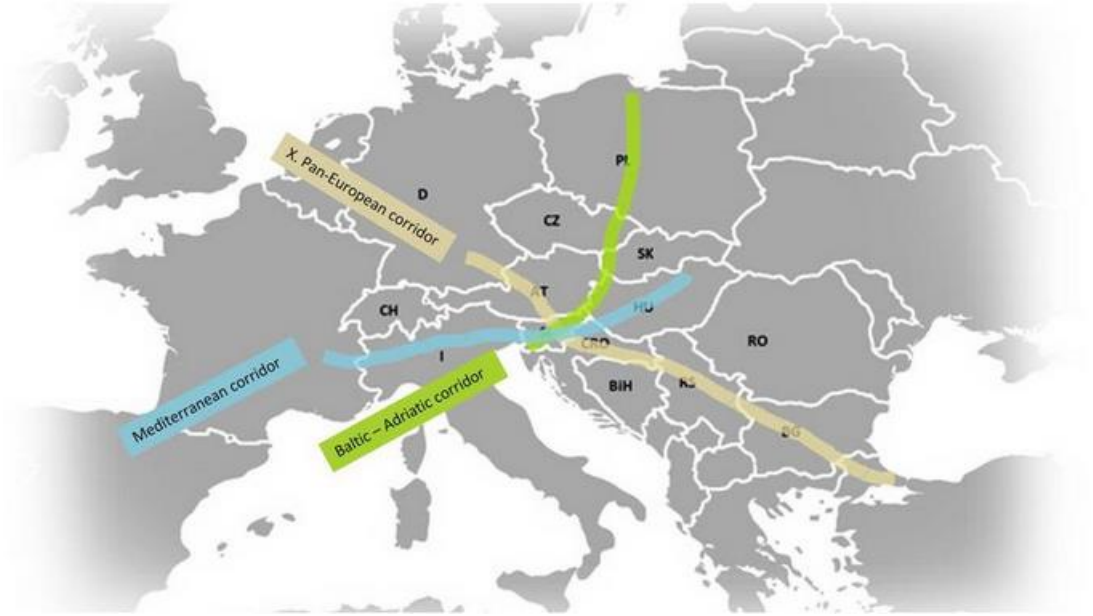


Figure 6: Transport corridors through Slovenia (Invest Slovenia, 2019).

As railway service is regaining its importance, infrastructure modernisation on the Pan-European Transport Corridors No. V and X is one of national priorities. Freight traffic is well developed, and the rail links between the Adriatic Sea and the landlocked CEE countries offer plenty of opportunities. The Slovenian railway network is 2,178 km long.

The broad network of railway lines enables door-to-door cargo transport services and the shunting yard in Ljubljana guarantees quick transport across Slovenia. Both freight and passenger service with southeastern Europe has grown over the last few years.

The national rail operator Slovenian Railways (SŽ) runs both passenger and freight service and operates railway infrastructure including 60,000 m2 of warehouses. It also provides combined transport services, and has container terminals in Ljubljana, Maribor and Celje. In 2014, Slovenian Railways transported 18.8 million tons of goods and its trains travelled 4,278 million net ton kilometres.

The Port of Koper, the largest of Slovenia's ports, represents the southern gateway to international commercial links between Europe and overseas. It lies on the shortest transport route linking commercial centres in Central and Eastern Europe with Mediterranean countries and countries along the Suez Canal (Figure 7). Shipping to the Port of Koper means gaining 7 to 10 days for ships arriving from Asia compared with sailing Europe's northern ports. Your goods will be in Vienna, Munich or Prague in 24 hours or in two days' time in Warsaw, Copenhagen or London. These facts have

contributed to the development of the Port of Koper into a logistical and distribution centre significant at all times.

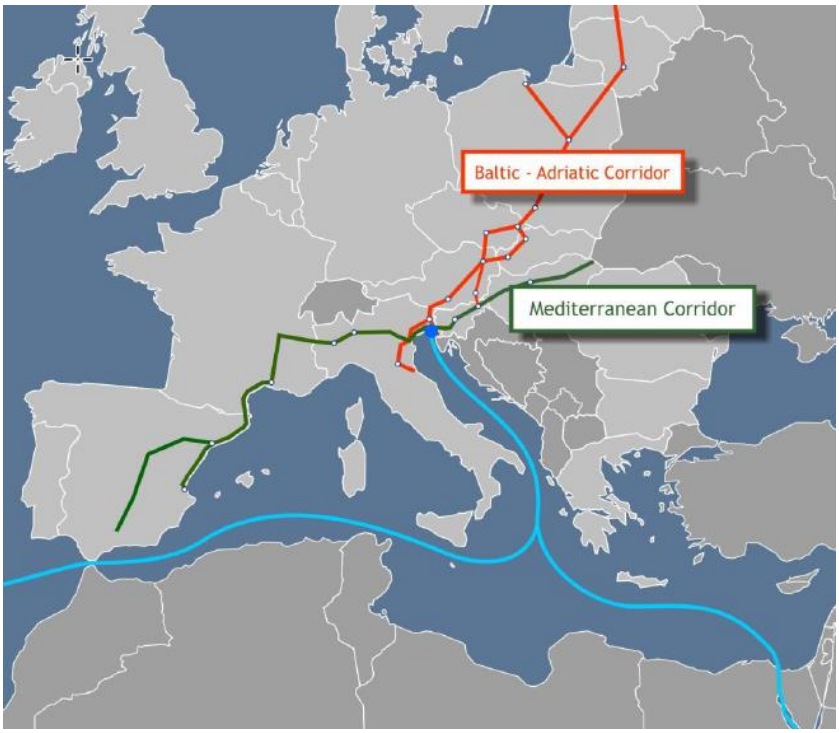


Figure 7: Port of Koper strategic position.

There are currently **12 modern and fully equipped terminals** specialised for various types of goods. Port of Koper has also indoor and outdoor warehouses for general cargo and several special warehouses:

- Indoor warehouses for general cargo, 275,400 m2
- Special warehouses for fruit, 73,000 m2
- Outdoor warehouses for general cargo, 960.000 m2
- Grain silos, 60,000 tons
- Soya warehouse, 55,000 tons
- Reservoirs for liquid cargo, 53,647 m3
- Depots for dry bulk, 110,000 m2

Port of Koper green orientation is reflected in:

• DPN ensures the sustainable development of the port,

• investing in environmentally friendly technology (electric drive, closed transmission systems, etc.)

• an effective environmental management system (EMAS),

• we produce our own olive oil,

- We work socially responsible,
- Open to the public - more than 20,000 visitors annually.

Ports of the future strategy is focused on:

- Technological innovation: Efficient handling and storage equipment (advanced, automated, reliable solutions), innovative logistics services and internal logistic processes, ICT interactions (B2B, B2G) + "safety & security" + comprehensive management.
- Environment & Energy: reducing noise and preventing other emissions, solutions for the deposit or recycling of sediments, efficient energy consumption (alternative sources).
- Promotion of green logistics: modal split in favor of rail transport, intermodality.

Ljubljana Jože Pučnik Airport, 25 km from the capital is the main Slovenian airport for passengers and cargo. Regular and charter flights carry passengers to all important European destinations. The airport is in a process of continuous transformation, becoming an important regional distribution and logistics centre.

Year 2015 will be remembered in particular for integration of Aerodrom Ljubljana into the Fraport Group, and for a sharp increase in passenger numbers. Passenger numbers in public transport are up 10.3% on previous year at over 1.4 million passengers, while the total cargo tonnage is comparable (approx. 18,500 tonnes). Passanger and goods transport and traffic for last 15 years are shown in figure 8 and 9.

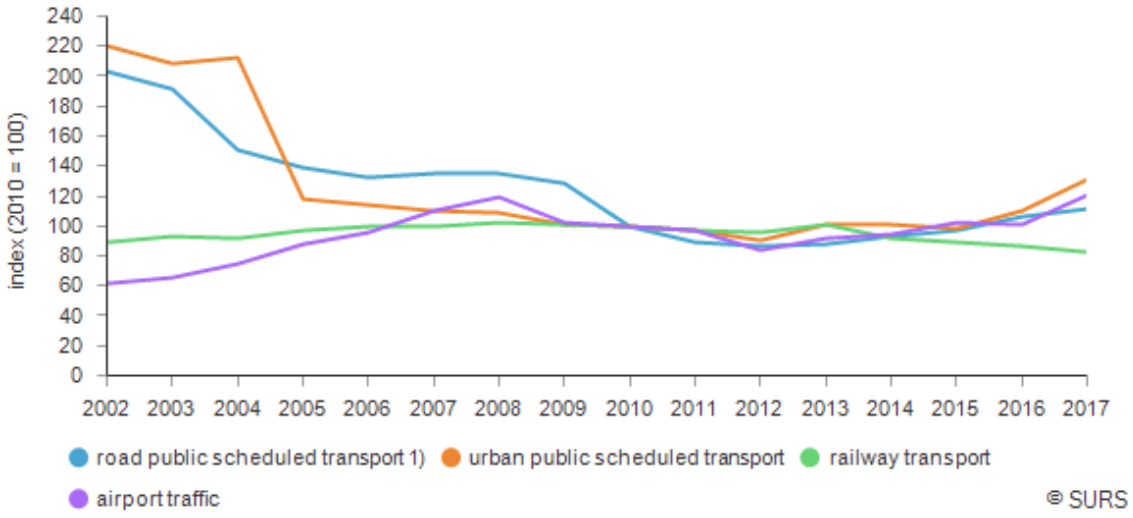


Figure 8: Passenger transport and traffic index for Slovenia (SURS, 2019).

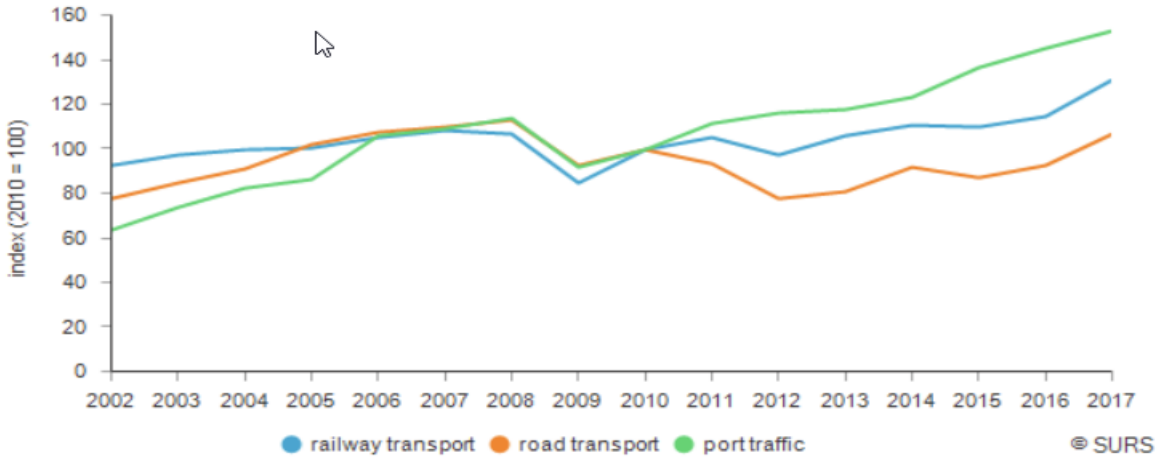


Figure 9: Goods transport and traffic index for Slovenia (SURS, 2019).

The trend in the growth of total passenger kilometers in public passenger transport from the previous two years continued in 2017, and the value of the indicator reached the value of 2011 and / beginning of the observed period. The positive changes in this area bring results, the target value of passenger kilometers for 2020 is approaching and will continue to be achieved with the 2017 growth (Table 2).

Table 2: Passenger transport and traffic, Slovenia (SURS, 2019).

Passengers carried (1,000)	2016	2017	2017/2016
Road public scheduled transport[1)]	30,287	31,903	105.3
Urban public scheduled transport[1)]	51,986	61,776	118.8
Railway transport	14,008	13,422	95.8
Air transport	1,452	1,210	83.3
Airport traffic	1,411	1,686	119.5
Port traffic	109	108	98.5
Border road traffic	60,655	57,822	95.3
Passenger-kilometres performed (mio)			
Road public scheduled transport	519	554	106.8
Railway transport	680	650	95.6
Air transport	1,481	1,203	81.2

In line with the goal, it is necessary to provide faster growth of rail freight traffic than road transport, which has been achieved in the observed period. The share of rail transport in total freight traffic with at least one point in Slovenia continues to insist on the projection values of the indicator and is also above the indicative target for 2020 (Table 3). The number of tonne-kilometers traveled in road transport increased by 12.4 per cent in the observed period %. In the same period, the number of tonne-kilometers transported in rail transport increased by 30.5%.

Table 3: Goods transport and traffic, Slovenia (SURS, 2019)

Goods carried (1,000 tonnes)	2016	2017	$\frac{2017}{2016}$
Road transport	75,052	86,212	114.9
Railway transport	18,596	21,275	114.4
Air transport	1	2	127.4
Airport traffic	10	12	118.1
Port traffic	21,171	22,311	105.4
Tonne-kilometres performed (mio)			
Road transport	18,714	20,814	111.2
Railway transport	4,360	5,128	117.6
Air transport	1	2	148.0

1.1.2. Impact on Climate Change

GHG emissions from transport in Slovenia increased by 166% by 2014 compared with 1986. In the EU, GHG emissions after the fall in the period 2008-2013 also rose again; in the period 1990-2014 they increased by 13% (in Slovenia at that time by almost 97%). Among these green gases are carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), fluorinated hydrocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF6). Due to their comparability, the quantities of TGP emissions are converted to the CO2 equivalent, which takes into account the differences between the greenhouse potential of individual gases. Emissions from traffic refer to the first three gases (ARSO, 2016).

The main source of TGP is mostly road transport, which contributes as much as 99% of all TGP emissions. The share of traffic discharges in total GHG emissions (32.5% in 2014) and not enough effective measures to reduce them make Slovenia's efforts to meet its commitments difficult (Figure 10).

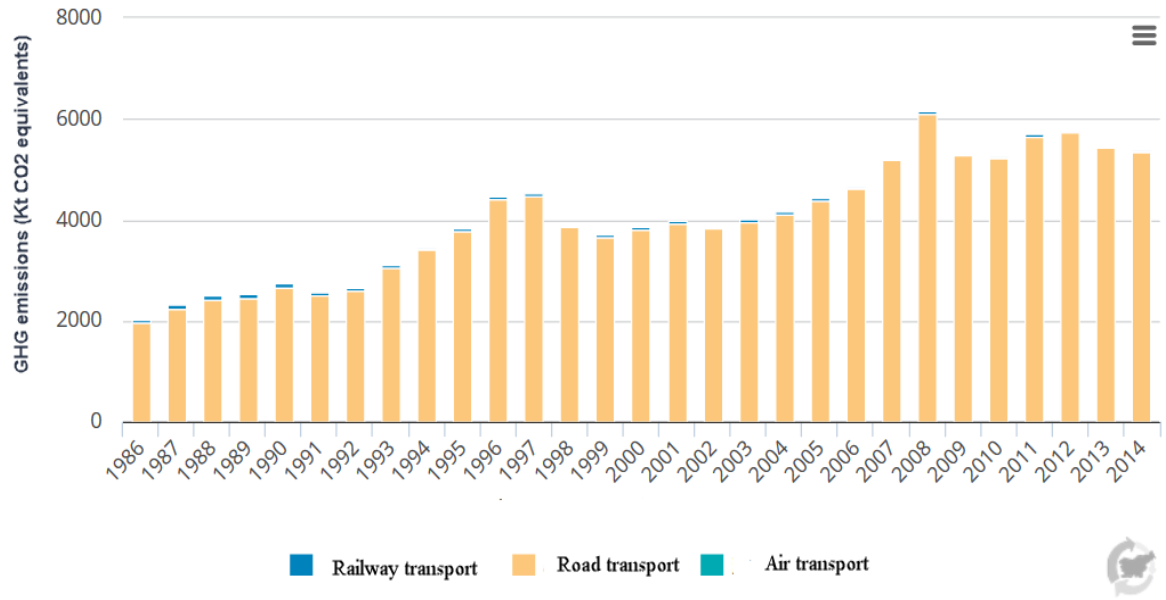


Figure 10: GHG emissons in trasport according the mode of transport in Slovenia. (ARSO, 2016)

GHG emissions changes in years 1986 to 2014 is shown in Figure 11 across the type of gas and mode of transport.

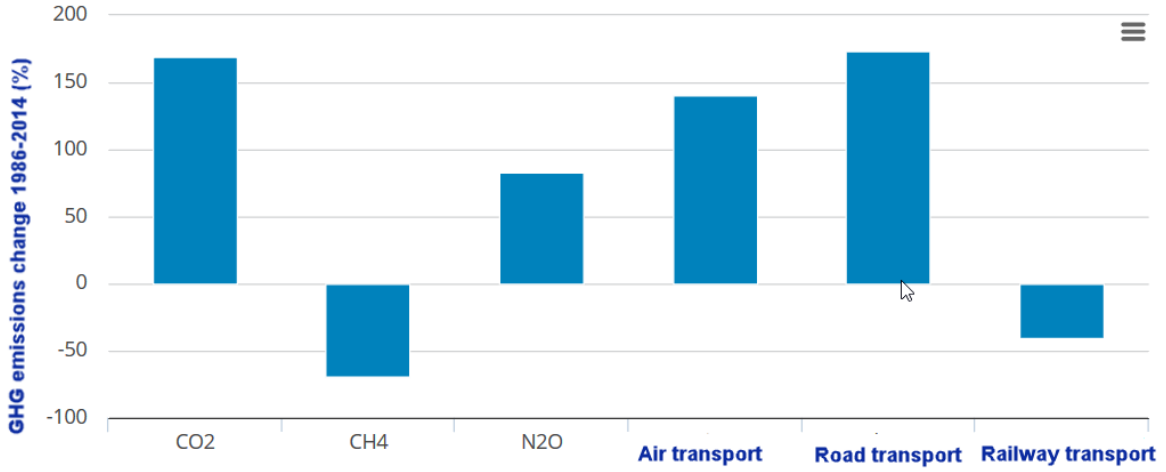


Figure 11: GHG emissons changes of transport from 1986 to 2014 (ARSO).

In accordance with Decision No. 406/2009, each Member State shall, by 2020, restrict greenhouse gas emissions from sectors not included in emissions trading by at least the percentage specified for that Member State in relation to its 2005 emissions. Slovenia may thus have a discharge of 4% higher than emissions in 2005.

According to Directive 2009/30 / EC, fuel suppliers have to reduce the life cycle of GHGs from road transport by 6-10% by 2010 to reduce their life cycle by 2010 compared to 2010. The reduction should be achieved through increased use of biofuels, alternative fuels, reduction incineration of exhaust gases and exhaust at production sites, using environmentally-friendly carbon capture and storage technologies and the introduction of electric vehicles. Member States' contributions to CO2 emissions, CH4 and N2O emissions is shown in Table 4.

Table 4: Member states' contributions to GHG emissions (European enviroment Agency, 2018).

Member State	GHG emissions in 1990 (kt CO2 equivalents)	GHG emissions in 2016 (kt CO2 equivalents)	CO2 emissions in 1990 (kt)	CO2 emissions in 2016 (kt)	N2O emissions in 1990 (kt CO2 equivalents)	N2O emissions in 2016 (kt CO2 equivalents)	CH4 emissions in 1990 (kt CO2 equivalents)	CH4 emissions in 2016 (kt CO2 equivalents)
Austria	13 973	23 488	13 777	23 274	128	203	68	11
Belgium	20 892	26 390	20 553	26 093	218	280	121	17
Bulgaria	6 605	9 350	6 426	9 239	107	85	71	26
Croatia	3 881	6 173	3 787	6 101	53	60	41	12
Cyprus	1 229	2 022	1 196	1 959	28	52	5	11
Czech Republic	7 284	18 450	7 032	18 028	214	395	39	27
Denmark	10 775	12 987	10 617	12 835	101	141	58	11
Estonia	2 477	2 377	2 416	2 347	38	26	23	4
Finland	12 101	12 612	11 827	12 512	161	80	113	20
France	120 665	132 848	118 713	131 121	949	1 580	1 003	148
Germany	164 404	166 815	161 882	165 046	1 193	1 623	1 329	145
Greece	14 507	17 439	14 124	17 132	272	233	110	73
Hungary	8 876	12 480	8 685	12 318	127	137	63	26
Ireland	5 137	12 294	5 022	12 149	66	131	49	14
Italy	102 100	104 505	100 240	103 379	953	908	907	218
Latvia	3 042	3 198	2 941	3 147	81	47	20	4
Lithuania	5 838	5 496	5 706	5 432	80	51	52	13
Luxembourg	2 585	5 480	2 556	5 431	18	48	11	1
Malta	331	633	326	628	1	3	3	2
Netherlands	28 031	30 509	27 731	30 202	105	247	196	61
Poland	20 496	53 415	19 985	52 777	331	526	180	112
Portugal	10 229	16 677	10 046	16 491	98	160	84	25
Romania	12 439	16 828	12 059	16 588	285	205	94	36
Slovakia	6 824	6 747	6 693	6 665	100	73	30	9
Slovenia	2 728	5 734	2 666	5 664	36	65	26	6
Spain	59 199	86 131	58 288	85 145	527	896	384	89
Sweden	19 107	16 891	18 772	16 721	180	150	155	19
United Kingdom	121 321	123 528	118 609	122 185	1 465	1 233	1 246	110
EU-28	**787 074**	**931 496**	**772 675**	**920 611**	**7 917**	**9 637**	**6 481**	**1 248**
Iceland	620	974	600	934	16	36	4	3
United Kingdom (KP)	122 130	124 321	119 403	122 970	1 473	1 239	1 254	112
EU-28 + ISL	**788 503**	**933 263**	**774 069**	**922 330**	**7 941**	**9 680**	**6 493**	**1 253**

White Paper and Roadmap for moving to a competitive low-carbon economy in 2050 sets out the following objectives for the release of TGP from the market:

- reducing GHG emissions from the market by 20% by 2030, compared to the values in 2008 and by at least 60% by 2050 (compared to 1990 levels);
- the achievement of a 40% share of sustainable low-carbon fuels in aviation and the reduction of CO2 emissions in the EU resulting from fuel from tank tanks by 40% (if possible by 50%) by 2050 (compared to 2005 values) .

The operational program of measures to reduce greenhouse gas emissions by 2020 in transport envisages a reduction in GHG emissions from the transport by 9% by 2020 compared to emissions in 2008. The long-term goal is to reduce emissions from this sector by at least half by 2050.

1.1.3. Efficient Fleet and Personnel Management

Intelligent transport systems (ITS) based on information and communication technologies (e.g., navigation system, systems for detecting and reporting traffic accidents, traffic accident prevention systems, electronic toll collection systems, road surface monitoring systems, video surveillance systems, information services (weather, traffic status data), vehicle tracking systems, Fleet management systems) provide effective support users of transport infrastructure. They improve safety by pre-warning on dangerous situations, and in particular by controlling and managing traffic. They increase the quality of the whole transport system and enable the achievement of socioeconomic and ecological goals.

As with other ITS, fleet management systems also contribute to regulating traffic and introducing much needed discipline and culture to the transport field. This is also a logical consequence when control is present. A wide range of data is guided. From location, time and duration of stops, to the average and maximum speed of movement. With the fully installed system, a number of features are available that are enabled by the following applications (Grebenc, 2014):

• Tracking the vehicle more vehicles on digital vector cartography of Europe with the corresponding speed of movement.

• Review and analyze the route of the vehicle in the current day and for the past days (duration, kilometer).

• Optimize the route and send a direct route to the vehicle and direct the driver from the office.

• Monitoring several different driving parameters (engine speeds, engine torque, fuel consumption and fuel consumption, quick acceleration / braking, engine temperature, idling time).

• Written communication between the driver and the control center (sending text messages to the vehicle or from the vehicle).

• Electronic completion of travel orders.

• Identifying the driver in the vehicle.

• Monitoring of the temperature in the cargo area (important for EU regulations; it is necessary to control the temperature in vehicles transporting food and medical products).

• Creating various detailed monthly reports (including all data).

• Speed regulator status - on / off.

• Cargo space position - open / closed (important for distribution companies).

• Setting alarms for violations of instructions and restrictions.

• Emergency pressure switch at the driver (for example, an attack on a vehicle with a valuable cargo).

• GPRS communication across Europe (wide coverage area) and data transfer from FMS / CAN.

Introduction of ITS in fleet management system may have a two-fold results on primary level (better efficacy of vehicles and drivers, more accurate information and quick response, control of driver's handling with the vehicle, speed, and power engine revolutions and torque control, braking system control, driver's safety control) and on secondary level (keeping records, electronic travel orders, live reports, history, alarm system, pollution and emissions control).

Technological trends associated with the development of digitally supported platform business models can be divided into three groups (Sever, 2017):

1. cognitive (cognitive intelligence, artificial intelligence and machine learning, intelligent things and applications, data sciences)
2. digitalism (dialogue systems, block sequencing, digital technology platforms and models),
3. platforms (platform business models and networks).

The results of the survey from 2016 show that the fleet should rejuvenate and grow. Of 40% of the respondents forecast larger investments and the fleet will increase by 10 % per year. A strong impact on the renewal of the fleet has favorable forms of financing (Močnik, 2016).

There is a big problem in the industry, and consequently, the company's first place places administrative requirements in business. As many as 45% of all respondents selected the administrative obstacles as the biggest obstacle. This is completely in line with the survey at the level of all activities in Slovenia, which was carried out in April 2016 by analyst of the Chamber of Commerce and Industry of Slovenia. It is closely followed by the availability of a skilled workforce, as 40% of enterprises identified this component as the biggest barrier to business. The data of the Employment Service (ES) also confirm this, as more than 1,000 job vacancies are published on the ES's pages from this segment. Domestic demand ranks third, with a low third of the responses of neutrals. The challenges of access to finance and foreign demand are on average half of enterprises in their business. Domestic and foreign demand for their services is moderate, therefore, the surveyed companies expect even more activity in the promotion and performances in key markets (Močnik, 2016).

In comparison with 2014, the revenues of companies in transport activities decreased in warehousing (-29.4%) and in post and courier activities (- 1.5%), in other sectors of transport they were ok-repy, in road freight transport (by 9.2%), in transhipments (by 8.3%) and in logistics (by 5.3%). Exports contributed most to the increase in revenues, as they grew by 7.1% in transport activity in 2015, while domestic sales grew by 2.1%. Exports grew the most in passenger land transport and transhipment by 13.9%, while road freight transport was also slightly above the 10% increase in exports. The largest share of sales on foreign markets in net revenues is achieved by road freight transport (51.6%, in 2014 51.1%), about half of exports are achieved by rail freight (48.6%, in 2014 50.4%) and transhipment (48.4%, in 2014 46.2%) (Novkovič, 2016).

1.1.4 Load optimisation

The goal of the transport load optimization (TLO) is to optimize order quantities in terms of load planning, with a view to reducing transportation costs, increasing operational efficiency, and speeding up the loading and unloading of transportation units (SAP, 2019).

TLO uses an optimization algorithm for the optimal loading and fill-up of transportation units. You can control the algorithm regarding what is allowed (such as the dropping of a transportation unit), so that TLO can compare and contrast different results. The parameters provided allow you to define the TLO requirements according to your needs and to control the objectives of the optimization. For example, they can help you to control the following objectives:

- Minimize the number of required stacks and, ultimately, transportation units, by loading the TUs in a compact manner
- Maximize the use of the TU itself in terms of volume and weight capacity
- Optimize the load handling by loading in complete units (for example, layers) whenever possible

TLO includes the following steps (SAP, 2019)**:** consolidation and saving of transportation units, drop last transportation unit, and Fill-up. To use the TLO one's should complte the following steps: Configure TLO, Maintain TLO master data in the Restriction Profile, Assign Restriction Profile to the transportation lanes for subranges, Check results in Replenishment Workbench, Send order proposal to SAP Retail system (Figure 13).

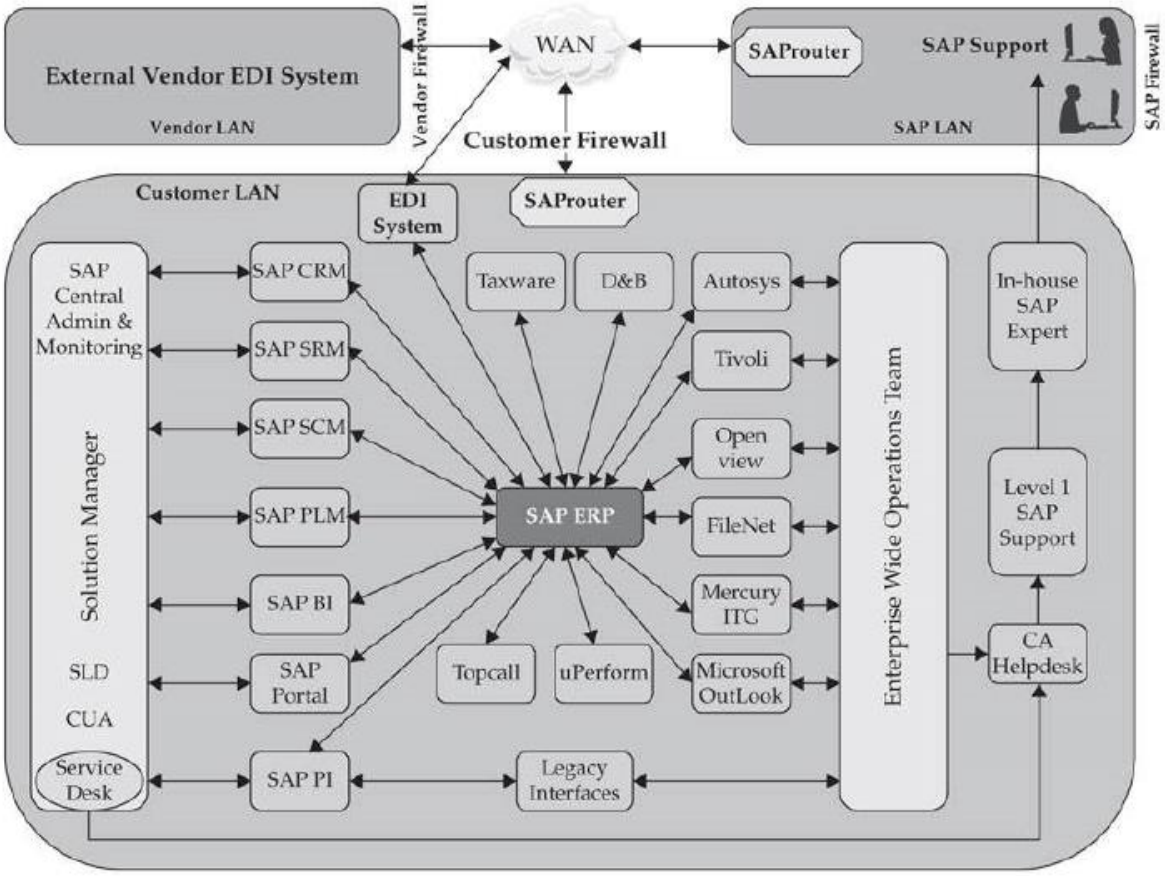


Figure 13: ERP interation scenarios (Tech Target, 2019)

Several Slovenian logistics and transport companies use SAP system combined with other advanced solutions (e.g., ASAP 8 FOR SIMPLIFIED RDS EXPERIENCE, HANA ASAP 8 METHODOLOGY, ASAP 8 FOR ASSEMBLE-TO-ORDER PROJECT, AGILE ASAP 8 METHODOLOGY, STANDARD ASAP 8 METHODOLOGY). Several interation scenarios exitst to boost effcieny where implementation of integration requires the cooperation of various experts on the client and the contractor's side (Tech Target, 2019).

1.2. Green Warehouses

In reducing carbon footprint, it should not be forgotten on the warehouses and their impact on greenhouse gas emissions and the impact on the environment. As estimated that warehousing costs is around of 21% of all cost of a product (Establish, 2014) which is reflected mostly in used electrical power and heat control. With saving energy in warehousing field of logistics the company can benefit to the carbon footprint as in business profit (Zafran, 2017).

The first and obvious improvement was in lightning and using (T5, T8, T12) fluorescent light tubes instead of light bulbs with wolfram filament. But since fluorescent tubes are commonly present for a long time nowadays all a dackate and more years old warehouses was equipped with those lights. Moreover the newer warehouses designs were starting using more natural (sun) light with integrating more glass surfaces into the it’s roofs. One such example is cargo port wearhouse in Koper as is shown in Figure 14.

Figure 14: Using natural light in warehouse of cargo port in Koper (Emigma 2017).

Second improvement which is often take into consideration regarding saving the electrical power is to equipped a warehouses with a solar power panels to produce electrical power. Since the warehouses are perfect buildings with a large tloris area and

not much caring about the aesthetics of the building. Allso the solar power plant mounting is sponsored by Slovenian government and that is why we can find some warehouses with solar power panels on top of it's roofs. One good example is the Merkur's solar power plant which was in 2012 the biggest power plant in Gorenjska region of Slovenia when it was build. The power plant consist of 2856 solar panels mounted on more than 10.000 m^2 area of roof as it is shown on the left side of the figure 6. The power plant is able to harvest 845.000 kWh of electrical energy which should be enough for almost of 200 households. Similar case was done by BTC wearhouse in Ljubljana (capital city of Slovenija) where they mounted the solar power plant with capabilities of 1MWh per year (Figure 15, right side). With this power plant they save 700 T of CO_2 emissions each year.

Figure 15: Solar power plant on the roof of the Merkur's warehouse in Naklo (left) (Merkur-nepremičnine, n.d.) and solar power plant on the roof of BTC (right) (Ba. P., 2011).

In 2013 it was exposed that Slovenian warehouses are poorly equipped with automated machines and robots (Pavlin, 2013). In that time forklifts was used in 58% of warehouses, but in 41% of warehouses the sorting was done by hand. Even worse in that time in Slovenia we did not had any of warehouse with robots. But nowadays we can notice that situation is much better. The automatization is well present in most of warehouses, robotization is in deployment phase and in some large warehouses like Logistic center BTC they starting implementing the artificial intelligent and blockchain technology for optimization of internal processes of warehouse (EOL 2018/7). But in general in Slovenian warehouses we still lacking of IT support a warehouse management. Bahovec (2016) has presented that still 62% of warehouses does not use efficient information support. Because of this weakness in the logistics process the companies are

facing with the problems like: delivery delay, mismatch information on stock and maintenance of oversized warehouses.

1. 3. Green Packaging and Waste Management

Waste management and green packaging often goes hand in hand as mostly packaging material ends up as a waste. That being said it is obvious that good packaging designing can significantly impact on waste masses and can reduce waste costs. Precisely in this tail, we can introduce Ljubljana's largest waste management company "Snaga" which fist self-service bulk product vending machine for: liquid detergents, shampoos, several different vinegars and oils as represented on the Figure 16. Person must bring their own storage container and a lot of packaging waste is saved.

Figure 16: First self-service bulk product vending machine - Bert (City of Ljubljana, 2018)

Another innovative company from Slovenia Plastika Skaza (Velenje) developed "composting machine" called "Bokashi Organko" for which they win the reddot design award in 2019. It is a kitchen in-door compost that can rescue bio-waste in households, particular useful in cities. The device is presented in Figure 17 and one can put in all meal leftovers or cuts of food and microorganisms inside a container will speed up the fermentation process. In short time we get sofen bio-waste that can be easily mixed with soil in the garden or in flower pots. The Croatian city of Osijek assured through European funds for its citizens this compost machine and reduced the volume of biological waste for almost 25% (EOL 2018/6).

Figure 17: Components of kitchen in-door compost device(Skaza, n.d.).

In the aspect of reusability of waste material we have to mention a company "M Sora" which developed a production of a new house windows and doors from used and discarded - but still quality wood. As part of the ReWin project we can find a really good looking windows and doors from the wood of an old hayrack pillar. For such an innovative approach of cascade use of wood the company win the bronze prize from Slovenian Chamber of Commerce for innovation in 2018 (EOL 2018/7).

Historically, at least in the flexible packaging industry, words like “recyclable”, “biodegradable”, “compostable”, and “eco-friendly” have been synonymous with diminished quality of the packaging material (Emmerson 2017). Nowadays that’s simply no longer the case. To improve processes regarding the packaging some companies (like: Ljubljanske mlekarne, DM drogerie markt d.o.o.) try to achieve faster recycling and easier sorting of packaging material. Some other companies goes even further try to make a better quality packaging to last longer or even be used several times which significantly reduces CO_2 emissions and reduces the indirect costs of a product.

For example the company Tricor d. o. o. developed corrugated cardboard that is stiff enough which can protect products from impact during transport. This cardboard can replace wooden boxes (Figure 18) and is cheaper to produce (EOL, 2018).

Figure 18: More stiff corrugated cardboard packaging instead wooden boxes (EOL, 2018).

1.4. Green Logistics Data Collection and Management

Mobility, transport and logistics within the SRIP - Smart Cities and Communities (PMiS) include increasing mobility of people and goods and based on intelligent, affordable, safer, more streamlined and greener urban and suburban transport. These solutions can be achieved through an integrated transport policy, optimizing urban and community mobility in an efficient and integrated system that will operate in exceptional circumstances. It needs to be supported by intelligent transport systems (ITSs), green cargo corridors, e-freight transport and enable innovation in mobility.

Slovenian companies and research institutions cover the entire value chain of mobility, transport and logistics in a smart city and community, as there are a large number of companies in Slovenia, including SMEs, marketed in high-tech mobility and logistics products and services. The integration of their products and services will enable comprehensive technological solutions that will compete both on the domestic and the global market. Slovenian research institutes in the field of mobility, transport and logistics show excellent scientific results and already assume a linking role among the companies that are leaders in this field.

The activities of companies in the field include (SRIP, 2019):

- the production of technologies for human mobility and public transport;
- the mobility of goods and alternative forms of transport;
- intelligent transport systems (ITS);
- autonomous forms of transport and management of transport flows;

- energy sources / distribution channels and wireless charging systems for batteries;
- local transport solutions and management of parking spaces, delivery and service
routes;
- management of harmful emissions / emissions and noise;
- systems for the sharing of means of transport;
- the development of mobile applications and the establishment of platforms;
- management of charging infrastructure (EV, LPG, NLG);
- CRM systems;
- ITS - sensors, tracking and control: GPS, CAN, accelerometers, emission and noise
meters;
- speech technology;
- computer vision;
- transport organizers;
- collection and contextual analysis of data and the development of social networks;
integrated logistics solutions;
- measuring the impact of traffic on air quality and the quantification of improvements.

Breakthrough technologies and focal areas in Data communications and analyzes is focused (SRIP, 2019): sensor infrastructure (antenna technique (SAT), cameras (DRSC), license plate recognition (LPR), scales, counters and other meters); Single Window (SWi); Internet of Things (IoT); physical internet; computer vision and biometrics; analytical platforms (GIS); structured data fusion (identification of objects, models, integration of heterogeneous data flows, semantic integration, ...); analytical tools for perceiving and predicting trends (machine learning); environmental simulations; tools for visual data analysis (through an interactive site map, tools for analysis of large networks); iterative data processing tools (metadata editors, data viewers, ...), V2X communication (Vehicle to Vehicle, Vehicle to Infrastructure).

1.5. Overall Green Logistics Applications

Slovenia offers unparallel expertise and knowledge of transportation services, distribution and warehousing services, retailing, and services involving information technology applications at reasonable cost.

Running the process of planning, storing, and controlling the flow of goods, services, and related information calls for well educated and highly skilled workforce and Slovenia has it all. It is easy to build a team of like-minded individuals who can deliver quality work and develop strong relationships with customers – valuable qualities when demand in developed economies remains subdued and industrial groups are slow to re-stock (INVEST Slovenia, 2019).

A number of logistics parks constructed close to highways, rail, intermodal facilities and air-cargo airports, facilitates national and regional distribution, but further investments in transport infrastructure is necessary to become a logistics platform serving central and south-eastern Europe. Many Slovenian transport and logistics companies have expanded operations to the CSEE countries where Slovenia is one of the most important foreign investors (INVEST Slovenia, 2019).

Slovenia's well-developed transport infrastructure facilitates economic growth by improving mobility and logistics hubs cater to distribution and storage needs. To increase traffic flows and improve mobility, investment in the development of multimodal transportation and the modernisation of the existing infrastructure is a priority and co-financing from the EU Cohesion Fund is available for projects that enhance territorial cohesion between Member States (INVEST Slovenia, 2019).

Economic growth has provided the logistics with what it needed most – with goods. At the same time we are facing the lack of logistic capacities and human resources together with constant increase of price pressure on the one hand, and pressure on wages on the other (Slovenian Logistic Association, 2019). Organisational and technological modernisation in green logistics are focused on (Slovenian Logistic Association, 2019):

- Efficiency of logistics in the international environment depends, amongst others, on administrative and legal frameworks imposed by the state. Development of logistics cannot be viewed from the technological and organisational point of view or on a company level only. Competitiveness of the business environment depends also upon administrative procedures and their technological solutions on the state

level. Also in Slovenia there is an ever-growing talk about “Digital Agenda”, however; we should be able to rely on already established good practices when applying it.

- Slovenia was among the first countries in Europe who have ratified the eCMR protocol. The European Commissiona aims to make the use of CMR documents mandatory in the near future.
- Organisational and logistics management models are a challenge. Soft methods of increasing productivity, KAIZEN, target management, etc. are models which are not used in production only, but can also effectively improve productivity in logistics.
- Digitalisation in logistics is an ongoing challenge. Even excellent solutions for managing goods, transport, and logistical data can be poorly implemented, and on the other hand companies can benefit most from niche solutions, perfectly covering separate business segments.
- Technological development in logistics is continuous. There are growing tendencies of use of increasingly advanced technologies for practical purposes.

2. GREEN LOGISTICS POLICIES

2.1. International and EU framework

Slovenia is a party to the Kyoto Protocol, an international agreement aimed at reducing carbon dioxide emissions and five other greenhouse gases (methane, nitrogen oxide, fluorinated hydrocarbons, perfluorocarbons and sulfur hexafluoride). Slovenia is also a party to the Paris Climate Agreement that represents the upgrading of the Kyoto Protocol for the period after 2020 (Vlada RS, 2018).

As a member of European Union Slovenia is actively involved in efforts regarding environmental politics of the EU. The European Union has set the basic objectives in climate and energy package of 2008, in which it committed itself to reducing greenhouse gas emissions of gas by 20% by 2020 compared to 1990, but also by 30% in in case of a wider international agreement and increase the share of renewable energy to 20% by 2020. The EU also committed itself to increase the share of biofuels to 10 %. In the

framework of the European Union, Slovenia is also involved in the Green Diplomacy Network, and also participates in the Working Party on International Environment Issues (WPIEI) (Vlada RS, 2018). As any other EU member state Slovenia is committed to a number of EU regulations and directives that deal with issues related to environmental protection in detail (Environment and climate change, n.d.).

2.2. Environment in the Slovenian Constitution

In the Slovenian legal order, the environment is a constitutional category. The Slovenian Constitution provides that everyone has, in accordance with the law, the right to a healthy living environment. The state takes care of a healthy living environment. For this purpose, laws determine the conditions and modalities for performing economic and other activities. In determining the basic principles of regulating the way of acquiring and enjoying property, beside economic functions Slovenian Constitution also defines social and ecological functions of property (Ustava Republike Slovenije, 1991).

2.3. Legislation that affects transport

For performing the transport of passengers and goods in national and international road transport Slovenian law prescribes several requirements relating to the protection of the environment. In the records of licences issued, among the other data, also the data about environmental quality of vehicles shall be kept. For obtaining a licence undertakings, which wish to perform the activities of road transport operator, must have good repute. This includes the requirement that a person has not been convicted of a criminal offence against the environment, physical space and natural assets. In some cases transport operator must obtain permits for international goods transport by road. In distributing permits also environmental quality of the vehicle fleet is considered as a criteria (Zakon o prevozih v cestnem prometu, 2006).

The Slovenian law prescribes motor vehicle tax, which is paid upon the first purchase or registration of a vehicle. The tax rate for motor vehicles depends on the amount of carbon dioxide emissions of combined driving and the type of fuel used for propulsion. For the vehicles that use gasoline, liquefied petroleum gas or electricity the tax rate is lower than for the vehicles that use diesel fuel (Table 5). The tax rate increases

if the amount of carbon dioxide emissions is higher (Zakon o davku na motorna vozila, 1999).

Table 5: Tax rate (%) of the tax base (the selling price of an individual motor vehicle) according to the type of fuel (Zakon o davku na motorna vozila, 1999).

CO_2 emission (g/km)	Tax rate (%) of the tax base	
	Gasoline, liquefied petroleum gas, electricity, combination (hybrid vehicle)	Diesel fuel
from 0 to 110 inclusive	0.5	1
from 110 to 120 inclusive	1	2
from 120 to 130 inclusive	1.5	3
from 130 to 150 inclusive	3	6
from 150 to 170 inclusive	6	11
from 170 to 190 inclusive	9	15
from 190 to 210 inclusive	13	18
from 210 to 230 inclusive	18	22
from 230 to 250 inclusive	23	26
from 250	28	31

In Slovenia an annual duty for the use of road vehicles must be paid for each motor vehicle. The amount of duty is defined by the engine capacity, but for the heavy vehicles and for all the transport vehicles also emission characteristics are taken into account. For this purpose, the Slovenian regulation applies the criteria based on exhaust pollution limits, known as the Euro emissions standards (Euro 0, 1, 2, 3, 4, 5, 6 …) For the vehicles with the highest amount of exhaust emissions (EURO 0 or lower requirements) the duty

increases for 40 %. On the other hand, the duty for the vehicles with the lowest amount of exhaust emissions (EURO 6 or higher requirements) decreases for 35 % (Uredba o letni dajatvi za uporabo vozil v cestnem prometu, 2018). Motor vehicles which are equipped with only an electric drive motor are exempt from this duty (Zakon o dajatvah za motorna vozila, 2017).

The regulation affects the price of fuel through the determination of excise duties and carbon dioxide emission taxes. In the period from May 7, 2019 to May 20, 2019, excise duty for the gasoline was 0.47829 EUR per litter, representing 35.30 % of the retail price. For the diesel fuel excise duty was 0.39272 EUR per litter, representing 30.40 % of the retail price. carbon dioxide emission tax for the gasoline was 0.03979 EUR per litter, representing 2.94 % of the retail price. For the diesel fuel carbon dioxide emission tax was 0.04671 EUR per litter, representing 3.62 % of the retail price. Regarding the regulation, therefore, gasoline is in general burdened with higher charges compared to diesel fuel (Ministrstvo za gospodarski razvoj in tehnologijo, 2019).

The general excise duty for electricity is 3.05 EUR/MWh. When consuming more than 10.000 MWh per year excise duty is 1.80 EUR/MWh (Zakon o trošarinah, 2016). For the liquefied petroleum gas excise duty is 127.50 EUR per 1000 kg and for the natural gas it is 0.0920 EUR per cubic meter (Uredba o določitvi zneska trošarine za energente, 2010).

The regulation also requires the payment of a contribution for energy efficiency that is paid by the final consumer of electricity, natural gas and heat, and the final customer of solid, liquid and gaseous fuels. The funds collected through this contribution are transferred to the Eco Fund, that provide financing for projects aimed at protecting the environment. The amount of the contribution, converted to the sales unit for each type of energy, is specified in the table 6 (Uredba o zagotavljanju prihrankov energije, 2014).

Table 6: The amount of contribution for energy efficiency regarding different types of energy (Uredba o zagotavljanju prihrankov energije, 2014)

Type of energy	Amount of contribution	Unit
Electricity	0.080	€c/kWh
Natural gas	0.757	€c/Sm^3
Heat	0.080	€c/kWh
LPG	1.023	€c/kg
Gasoline	0.736	€c/l
Diesel fuel	0.800	€c/l
Extra light fuel oil	0.800	€c/l
Fuel oil	0.882	€c/kg
Wood and wood waste	0.080	€c/kWh
Coal and coke	0.080	€c/kWh

The Ministry of Infrastructure is planning to introduce incentives for green action in the field of transport that include:

- purchase of high quality tires,
- upgrade of vehicles with spoilers to reduce airborne resistance,
- the processing of vehicles and buses to the biogas system,
- the purchase of vehicles and buses with biogas systems on compressed or liquefied natural gas,
- the purchase of electric buses (Dogovor v zvezi z izboljšanjem pogojev na področju avtoprevozniške dejavnosti, 2018).

Railways that offer the most environmentally friendly mode of freight transport, are managed by a state-owned companies, that also offer transport services and set prices for them.

2.4. The fund for green investments

The Slovenian state has set up a special fund (Eko sklad, Eco found), which aims to finance investments and activities related to protection of nature. The objective pursued by the fund is the transition to renewable energy sources, efficient use of energy, waste management and wastewater, permanent mobility and public awareness. The fund offers financial assistance mainly through loan from dedicated assets and through irreversible financial incentives. The key advantages of found loan compared to commercial banks are lower interest rates and longer repayment periods. Businesses, including companies involved in logistics, can obtain funding for investments in environmental infrastructure, environmentally friendly technologies and products, improved energy efficiency, investments in energy savings and use of renewable energy (Eko sklad o skladu, n.d.).

Specific incentives of the found are intended, for example, for:

- thermal insulation of walls, floors and roofs,
- installation of energy-efficient windows,
- heat pumps,
- wood biomass heating systems,
- solar collectors,
- ventilation by returning the heat of waste air in buildings,
- energy efficient lighting systems …

For each measure it is possible to obtain grants, loans or a combination of both, namely grants of up to 20 % of investment costs and credit up to 80 % of investment costs (Eko sklad javni poziv, n.d.).

2.5. Waste management

Regarding waste management, Slovenian Regulation determines the following priority order or hierarchy of conduct:

1. the prevention of waste,
2. preparation for re-use,
3. recycling,
4. other recovery operations (for example energy recovery),
5. disposal.

Waste from paper, metal, plastic and glass must be collected and stored separately. When storing, the producer of waste must prevent harmful emissions into the environment, fires, spillage of waste, blowing the waste particles with the wind … (Uredba o odpadkih, 2015).

The Regulation sets environmental goals for waste management. The recovery of packaging waste, including energy recovery, must be ensured for at least 60 % of the total mass of packaging waste. At least 55 % of the total mass of the packaging waste must be recycled. For every material it is necessary to provide recycling at least at the level of the following shares:

a) 60 % of the weight for glass,

b) 60 % of the weight for paper,

c) 50 % of the weight for metals,

d) 22.5 % of the weight for plastics,

e) 15 % of the weight for wood .

Regarding the consumption of plastic bags the Slovenian Regulation determines the goal of limited use of plastic bags, which is set at 40 bags per person annually. For this purpose the distributor must ensure that plastic bags at the point of sale are not available to consumers for free (Uredba o ravnanju z embalažo in odpadno embalažo, 2006).

Hazardous waste must be stored in packaging that prevents the endangerment of the environment and human health. Packaging in which hazardous waste is stored must be made of a material resistant to the effects of stored waste (Uredba o odpadkih, 2015).

For the recovery or disposal of waste, the operator must obtain a special environmental permit that can be granted to a legal entity or sole entrepreneur if certain conditions are met. Among the other conditions measures must be taken to meet environmental protection requirements, that prevent the emission of substances and energy into the environment. When it comes to waste incineration with energy recovery, it must take place in a waste treatment plant with a high level of energy efficiency (Uredba o odpadkih, 2015).

3. DRIVERS AND BARRIERS FOR GREEN LOGISTICS IMPLEMENTATION

3.1. Drivers

The reasons behind the adoption of green logistics practices of companies in Slovenia are;

- Innovation towards sustainable development, reducing environmental impacts or more efficient and responsible use of resources - eco- innovation,
- Increasing importance of green investments,
- Counseling and financial support for the implementation of the measures,
- Facilitate market access for environmentally friendly small and medium-sized enterprises,
- Support environmentally friendly entrepreneurship,
- Take advantage of opportunities offered by more environmentally-friendly value chains and efficient use of resources in small enterprises in the Slovenian manufacturing industry,
- Optimization and automation of production,
- Extra resources and trainings,
- Updating the infrastructure (Resolution on the National Programme for the Development of Transport in the Republic of Slovenia until 2030, 2017),
- Promotion of comprehensive processes of reversible logistics,
- Development of green transport corridors,
- Rational exploitation of waste materials,
- Promoting green logistics as a business opportunity to increase its own market share,
- Industry needs to recognize the benefits of green operation,
- Awareness of people,
- Quality of service (Za spremembe so potrebni znanje, želja in moč, 2014),
- Loans and subsidies for various measures of efficient use of energy and the use of renewable energy sources (Eko Sklad, n.d.),
- EU funds (Resolution on the National Programme for the Development of Transport in the Republic of Slovenia until 2030, 2017),

- Supporting the transition to the green economy by promoting new green technologies.

3.2.Barriers

The reasons for not reaching the desired level in green logistics sector in Slovenia could be summarized as:

- Higher investment costs,
- Companies have little funds for development and investment (Za spremembe so potrebni znanje, želja in moč, 2014),
- Lack of qualified personal (Tudi transportne poti je treba optimizirati, 2019),
- The pressure on prices of finished products is increasing, which also affects the prices of logistics (Tudi transportne poti je treba optimizirati, 2019),
- Inadequacy of port and railway infrastructure,
- It is necessary to increase investment in the preservation and maintenance of infrastructure (Zelena rast gospodarstva, n.d.),
- Companies are primarily concerned with increasing and improving production, but they do not think about the entire flow of material and goods flow (Kranjec, 2008),
- Country does not yet have a comprehensive logistics strategy.

4. TRAINING

Logistic technician is a sought-after profession all over Europe. In the future, even more demand is expected for this cadre. Logistics training provided in Slovenia will be examined under formal and non-formal education. Green logistics trainings will be examined inline with Logistics training in general. In Slovenia there is no program directly for Green Logistics.

4.1. Formal Education – Academic Trainings

The logistic technician is a sought-after profession all over Europe. In the future, even more, demand is expected for this cadre. Logistics training provided in Slovenia will be examined under formal and non-formal education. Besides that, we have also looked for schools and faculties that offer training in connection with environmental protection,

ecology, waste management, alternative energy sources, etc. Green logistics training will be examined in line with Logistics training in general. In Slovenia, there is no program directly for Green Logistics.

4.1. Formal Education – Academic Training

The Slovenian education system is organised into several levels of education (Slovenian overview, n.d.): pre-school, compulsory basic education, upper secondary education (include vocational, professional and general programmes), and tertiary education (include short-cycle higher vocational education and higher education).

4.1.1. Secondary Level Training

In Slovenia, we differ between 4 year-long programs and 3 year-long programs. After 3 year-long programs, students have the opportunity to continue their study on 2 year-long secondary programs. Students can begin their study for Logistic technician in secondary school and then continue their study at university.

Secondary education for Logistic technician in Slovenia at least 4 years. All students, after finishing elementary school, have the option of continuing their study on these programmes. The first enrolment into the program took place in 2008. 25 institutions offer training for Logistic technician:

- Andragoški zavod, Ljudska univerza Maribor,
- Andragoški zavod, Ljudska univerza Velenje,
- B&B izobraževanje in usposabljanje d. o. o.,
- Center za dopisno izobraževanje Univerzum,
- Ekonomska in trgovska šola Brežice,
- Ekonomska šola Murska Sobota.
- Ekonomska šola Murska Sobota, Srednja šola in gimnazija,
- Gimnazija, elektro in pomorska šola Piran,
- Izobraževalni center Geoss d. o. o.,
- Javni zavod Cene Štupar – Center za izobraževanje Ljubljana,
- Ljudska univerza Tržič,
- PRAH, izobraževalni center, izobraževanje in usposabljanje, d. o. o.,
- Prometna šola Maribor,
- Prometna šola Maribor, Srednja prometna šola in dijaški dom,

- Srednja trgovska šola Maribor,
- Strokovni izobraževalni center Ljubljana,
- Strokovni izobraževalni cenetr Ljubljana, Srednja poklicna in strokovna šola Bežigrad,
- Šolski center Celje,
- Šolski center Celje, Srednja šola za storitvene dejavnosti in lgistiko,
- Šolski center Nova Gorica,
- Šolski center Nova Gorica, Strojna, prometna in lesarska šola,
- Šolski cenetr Novo mesto, Enota za izobraževanje odraslih,
- Šolski cenetr Slovenj Gradec,
- Zasavska ljudska univerza,
- Zavod Znanje Postojna, javni zavod.

During the study, students achieve the following goals in the field of green logistics (Srednje strokovno izobraževanje, n.d.):

Students:

- *understand the impact of logistics on the environment and use environmental protection measures,*
- *know the importance of integrated waste management,*
- *get acquainted with the types and use of alternative energy sources and their impact on the environment,*
- *get acquainted with environmentally friendly forms of transport,*
- *understand the environmental significance of waste,*
- *learn about environmental protection and can identify environmental concepts,*
- *learn about environmental protection legislation in Slovenia and environmental standards (ISO),*
- *learn about sustainable use of natural resources in the field of sustainable energy (an increase of renewable energy sources),*
- *differentiate recycling processes,*
- *know the principle of energy management,*
- *know other modern transport technologies,*
- *protect the environment from pollution (e.g. hydraulic oil).*

After finishing any 3 year-long secondary education program, students can continue their study for Logistic technician at 2 year-long secondary programs. The first enrolment into the program took place in 2010. 17 institutions offer trainings for Logistic technician:

- Andragoški zavod, Ljudska univerza Maribor,
- Andragoški zavod, Ljudska univerza Velenje,
- Avtošola Ježica,
- B&B izobraževanje in usposabljanje d. o. o.,
- Center za dopisno izobraževanje Univerzum,
- Ekonomska in trgovska šola Brežice,
- Izobraževalni center Geoss d. o. o.,
- Javni zavod Cene Štupar – Center za izobraževanje Ljubljana,
- Ljudska univerza Celje,
- Ljudska univerza Tržič,
- PRAH, izobraževalni center, izobraževanje in usposabljanje, d. o. o.,
- Prometna šola Maribor,
- Strokovni izobraževalni center Ljubljana,
- Strokovni izobraževalni center Ljubljana, Srednja poklicna in strokovna šola Bežigrad,
- Šolski center Nova Gorica,
- Šolski cenetr Novo mesto, Enota za izobraževanje odraslih,
- Zavod za izobraževanje odraslih Radovljica.

During the study, students achieve the same goals in the field of green logistics as students of 4 year-long secondary school (Poklicno-tehniško izobraževanje, n.d.).

4.1.2. Higher Vocational Logistics Training Programs (2 years)

6 institutions offer training for Logistic engineer:

- B&B izobraževanje in usposabljanje d. o. o., higher vocational college
- B2 d. o. o., higher vocational college
- ERUDIO higher vocational college,
- PRAH izobraževalni center, higher vocational college,
- Prometna šola Maribor, higher vocational college,

- Šolski center Novo mesto, higher vocational college.

During the study, students achieve the following goals in the field of green logistics. There is no course directly linked to Green Logistics (Višješolski študijski programi, n.d.):
Students:

- *know the importance of global security – the working environment, transport and environment protection,*
- *understand the importance of economic use of means of transport (e.g. Reducing environmental burden),*
- *learn about the problem of protecting the natural environment as an important dimension of quality,*
- *learn about systems for the discharge of packaging from the environment,*
- *analyse the effects of transport on the landscape and the lives of people, especially from an ecological point of view,*
- *detect the consequences of environmental degradation in the local landscape,*
- *analyse the importance of large-scale construction work for people and possible negative effects of these on the environment,*
- *know the goals of environmental protection legislation in Slovenia,*
- *evaluate environmental policy,*
- *determine environmental indicators and indicators of sustainable development (determine the environmental indicator relevant to the field of transport and logistics, among the known environmental indicators),*
- *evaluate basic environmental indicators,*
- *use packaging in terms of economy,*
- *develop environmental protection with packaging waste,*
- *learn the principle of energy management,*
- *determine the objectives of integration of environmental aspects in the management of fuels,*
- *is aware of ecological and chemical aspects of burning fossil fuels,*
- *analyse the benefits of alternative fuels,*
- *define environmental-friendly forms of transport and infrastructure,*
- *analyse safety measures in the handling of hazardous substances (classification, labelling),*

- *learn about transport system emissions and impact on the environment,*
- *apply measures to reduce emissions of hazardous substances,*
- *recognise the importance of protecting and taking into account the importance of natural resources (biodiversity),*
- *create a conscious attitude towards environmental protection,*
- *analyse the importance of a reversible relationship between elements of manipulation with commodities and biodiversity,*
- *analyse the basic principle and guidelines for waste management,*
- *understand the hierarchy of integrated waste management.*

4.1.3. 1st Cycle Professional Study Programme (3 years)

In Slovenia, 4 faculties offer study about logistics (Table 7).

Table 7: List of faculties and logistics programs.

	University	**Faculty**	**Programme**
1	University of Ljubljana	Faculty of Economics	Business Logistics
2	University of Ljubljana	Faculty of Maritime Studies and Transport	Tranport technology and transport logistics
3	University of Maribor	Faculty of Logistics	Economic and Technical Logistics
4	Independent higher education institution	AREMA	Management of Transport Logistics

1. Faculty of Economics – Business Logistic (Poslovna logistika-usmeritev študijskega programa VPŠ, n.d): *t*here is no subject directly linked to green logistics. From subjects' descriptions is not clear to what extent the subjects are devoted to green logistics.
2. Faculty of Maritime Studies and Transport – Transport technology and transport logistics (Prometna tehnologija in transportna logistika, n.d.): *t*here is no subject directly linked to green logistics. From subjects' descriptions is not clear to what extent the subjects are devoted to green logistics.

3. Faculty of Logistics – Economic and Technical Logistics (Visokošolski strokovni študijski program, n. d.). We found two subjects where students gain some knowledge about green logistics:
    a. Management of green supply chain:

        Students learn about:

        - *green logistics and its paradoxes,*
        - *green supply chain,*
        - *green logistics in logistics subsystems,*
        - *green purchasing logistics,*
        - *green internal (production) logistics,*
        - *green warehouse logistics,*
        - *green distribution logistics,*
        - *green aftermarket logistics,*
        - *waste management,*
        - *environmental protection,*
        - *environmental costs,*
        - *green technologies and alternative energy sources in logistics processes.*

    b. Green technologies in logistics processes:

        Students learn about:

        - *logistic processes and green technologies,*
        - *the role of the country in the promotion of green technologies and renewable energy sources,*
        - *green technologies and renewable energy,*
        - *introduction and use of green technologies and renewable energy sources in logistics subsystems,*
        - *economics of integrating alternative fuels into logistics processes,*
        - *energy management in logistics organisations and new technological concepts,*
        - *studies of practical examples of the introduction of green technologies and green energy sources.*
4. AREMA (Management transportne logistike (VS), 2015): there is no course directly linked to green logistics. From subjects' description is not clear to what extent

subjects implement green logistics. Therefore we found subject that cover contents of the green logistics:

a. Sustainable transport and environmental protection:

Students learn about:

- *different ecosystems,*
- *legislation, and strategies that regulate their development,*
- *the impact of transport on the environment,*
- *how to plan and implement it with minimal impacts on ecosystems and the social environment.*

4.1.4 1st Cycle Academic Study Programme (3 years to 4 years)

In Slovenia, three faculties offer undergraduate study about logistics (Table 8).

Table 8: List of faculties and logistics programs.

	University	**Faculty**	**Program**
1	University of Ljubljana	Faculty of Economics	Business Logistics
2	University of Ljubljana	Faculty of Maritime Studies and Transport	Traffic Technology and Logistics
3	University of Maribor	Faculty of Logistics	System Logistics

1. Faculty of Economics – Business Logistic (Poslovna logistika-usmeritev študijskega programa UPEŠ, n.d): there is no subject directly linked to green logistics. From subjects' description is not clear to what extent subjects implement contents of green logistics.
2. Faculty of Maritime Studies and Transport – Transport technology and logistics (Tehnologija prometa in logistika, n.d.): there is no subject directly linked to green logistics. Contents of green logistics are implement in different subjects (probably, there are some other subjects that include contents of green logistics, but curriculums are not available on faculty's website):
   a. Transport engineering*:*

   Students learn about:

   - *connection of energy conversion and environmental stress,*
   - *understand the operation of various means of transport and the effects of operational conditions on their activity,*

- *fuel consumption, and*
- *the environment.*

b. Environmental protection

3. Faculty of Logistics – System Logistics (Univerzitetni študijski program, n.d.):
   a. Management of sustainable supply chain:

      Students learn about:

      - *green strategies in sustainable supply chains,*
      - *environmental protection and environmental costs in sustainable supply chains.*

   b. Transport logistics:

      Students learn about:

      - *applications of green principles in transport.*

   c. Business processes in logistics systems*:*

      Students learn about:

      - *sustainable entrepreneurship and the search for business opportunities in green logistics (students learn to recognize business opportunities in the field of green logistics).*

   d. Packaging and relieving logistics:

      Students learn about:

      - *environmental awareness and attention to the use of environmentally friendly materials.*

   e. Establishment and assessment of sustainable supply chains:

      Students learn about:

      - t*he role of the state in the promotion of green logistics,*
      - *environmental legislation,*
      - *green logistics and environmental standards,*
      - *integration of sustainable development into the strategies of organisations and supply chains,*
      - *carbon footprint of organisations,*
      - *processes and products,*
      - *the carbon footprint strategy,*
      - *using different alternative energy sources and green technologies in sustainable supply chains,*

- *business models of sustainable development of supply chains,*
- *establishing a sustainable supply chain,*
- *environmental standards and assessment,*
- *practical examples of carbon judgments.*

4.1.5 2nd Cycle Master Study Programme (1 year to 2 years)

In Slovenia, three faculties offer master degree study in relation to logistics (Table 9).

Table 9: List of faculties and logistics programs.

	University	**Faculty**	**Program**
1	University of Ljubljana	Faculty of economics	Business Logistics
2	University of Ljubljana	Faculty of Maritime Studies and Transport	Traffic (Transport Logistics), Maritime
3	University of Maribor	Faculty of Logistics	System Logistics

1. Faculty of Economics – Business Logistic (Poslovna logistika, n.d): there is no subject directly linked to green logistics. From subjects' descriptions is not clear to what extent subjects are devoted to green logistics.
2. Faculty of Maritime Studies and Transport (students can choose between two courses):
    a. Traffic (Promet, n.d.): there is no subject directly linked to green logistics. Probably, there are some subjects that include contents of green logistics, but curriculums are not available on faculty's website.
    b. Maritime (Pomorstvo, n.d.): there is no subject directly linked to green logistics. Probably, there are some subjects that include contents of green logistics, but curriculums are not available on faculty's website.
3. Faculty of Logistics – System Logistics (Magistrski študijski program, n.d.)
    a. Management of the life cycle of supply chains:

        Students learn about:

        - *environmental risk management in supply chains,*
        - *circular economy,*
        - *environmental friendly supply chains,*
        - *environmental management and ISO,*

- *value chains and supply networks – environmental benefits.*

b. Urban logistics and mobility:

Students learn about:

- *trends in the area of addressing negative impacts of logistics and transport within urban environments,*
- *successful practice in solving problems of logistics and transport in urban environments.*

4.1.6 3rd Cycle Doctoral Study Programme (3 years to 4 years)

In Slovenia, two faculties offer doctorate study about logistics (Table 10).

Table 10: List of faculties and logistics programs.

	University	**Faculty**	**Programme**
1	University of Ljubljana	Faculty of Maritime Studies and Transport	Maritime Studies and Traffic
2	University of Maribor	Faculty of Logistics	System Logistics

1. Faculty of Maritime Studies and Transport – Maritime (Pomorstvo, n.d.): students have a large selection of subjects, but no subject is directly related to green logistics.
2. Faculty of Logistics – System Logistics (Doktorski študijski program, n.d.):
   a. Sustainable transport management and the integration of the supply chain:
   Students learn about:
   - *EU policies and directive on sustainable transport,*
   - *sustainable mobility and green technologies,*
   - *alternative fuels and technologies in sustainable transport,*
   - *electromobility as a serious alternative integration of green technologies into sustainable supply chains,*
   - *management of sustainable transport and environmental impact assessment,*
   - *designing sustainable business models and systems by integrating green, sustainable technologies.*

4.1.7 Adult Education

Slovenian Institute for Adult Education (Andragoški center Republike Slovenije, n.d.) regulates adult education. On their website, you can find all the information about the selected training.

17 institutions carry out the training for Logistic technician (4 year-long) for adults. The curriculum covers the same goals in the field of green logistics as already have been described at secondary education for Logistic technician (4 year-long).

17 institutions carry out the training for Logistic technician (2 year-long) for adults. After finishing any 3 year-long secondary education program, adults can continue their study for Logistic technician at 2 year-long secondary programs The curriculum covers the same goals in the field of green logistics as already have been desribed at secondary education for Logistic technician (2 year-long).

4.1.8 National Vocational Qualifications

National Vocational Qualifications (Nacionalna poklicna kvalifikacija, 2014) allow you to assess and validate the knowledge and skills obtained through non-formal learning. An individual can choose different professions in the field of logistics. However, there is no choice from the field of green logistics, nor is it clear whether individuals who choose logistics will also learn topics in the field of green logistics.

3.2 Non-formal Logistic education

4.2.1 Slovenian Logistic Association

Slovenian Logistic Association (Slovensko logistično združenje, n.d.) is a voluntary, independent and non-profit association of members. Association is intended for professional operation and integration in the field of transport, traffic and business logistics. It brings together professionals, entrepreneurs and others who work in these fields and want to contribute to the comprehensive development of transport, traffic and business logistics through their activities in the society. Slovenian Logistic Association organizes workshops, conferences and congresses. The website does not show what the focus is on green logistics.

4.2.2 Logistic Congress

Logistic Congress (Logistični Congres, n.d.) is being held in Slovenia every year or every second year. Different lecturers (also foreign lecturers) and entrepreneurs attend Logistic Congress and share good practices, experiences, etc. From the programs of Logistics Congresses, it is evident that topics are also related to green logistics (e.g. presentations of good practises of companies).

4.2.3 3 PROJEKT

PROJEKT (n.d.) performs various training for employees. An individual chooses a workshop that he/she wants to attend. 3 PROJEKT offers several workshops related to logistics, but no workshop is directly linked to the field of green logistics.

4.3 Other training

Table 11 shows faculties offering education in connection with environmental protection, but not in direct connection with logistics. Students who finish these studies are not Logistic engineers, but they can have a good base for green logistics. There are 15 different institutions at various universities all over Slovenia. In Table 11 we can see programmes at different stages of the study. Programmes have in common the focus on environmental protection. Students learn about *environmental pollution, protection, ecology, alternative energy sources, principles of sustainable development, environmental legislation, measures to reduce CO_2, measures to reduce the consumption of secondary raw materials, wastewater and waste recycling,* etc.

Table 11: List of faculties that provide education about environmental protection.

	University	**Faculty**	**1st cycle Professional Study Programme**	**1st Cycle Academic Study Programme**	**2nd Cycle Master Study Programme**	**3rd Cycle Doctoral Study Programme**
1	University of Ljubljana	Biotechnical faculty	/	/	Ecology and Biodiversity, Economics of Natural Resources	Environmental Protection
2	University of Ljubljana	Faculty of Social Sciences	/	/	/	Environmental Protection
3	University of Ljubljana	Faculty of Civil and Geodetic Engineering	/	Water Science and Environmental Engineering	Water Science and Environmental Engineering	Environmental Protection
4	University of Ljubljana	Faculty of Chemistry and Chemical Technology	/	Chemical Engineering	Chemical Engineering	Environmental Protection
5	University of Ljubljana	Faculty of Mechanical Engineering	Power, Process and Environmental Engineering	Mechanical Engineering	Mechanical Engineering	Energetical, Process and Environmental Engineering Sciences
6	University of Ljubljana	Faculty of Natural sciences and Engineering	/	Geotechnology, Mining and Environment	Geotechnology	Environmental Protection
7	University of Maribor	The faculty of Energy Technology	Energy Technology	Energy Technology	Energy Technology	Energy Technology

8	University of Maribor	Faculty of Civil Engineering, Transportation Engineering, and Architecture	Traffic and Transportation engineering	Traffic and Transportation Engineering	Traffic and Transportation Engineering	Traffic and Transportation Engineering
9	University of Maribor	Faculty of Chemistry and Chemical Engineering	Chemical Engineering	Chemical Engineering	Chemical Engineering	Chemistry and Chemical Engineering
10	University of Maribor	Faculty of Natural Sciences and Mathematics	/	Ecology with Nature Conservation	Biology and Ecology with Nature Conservation	Ecology
11	University of Maribor	Faculty of Mechanical engineering	Mechanical Engineering	Environmental Engineering, Industrial Engineering, Mechanical Engineering	Environmental Engineering, Industrial Engineering, Mechanical Engineering	Environmental Engineering, Mechanical Engineering
12	University of Primorska	Faculty of Mathematics, Natural Sciences and Information Technologies	/	Conservation Biology	Nature Conservation, Sustainable Built Environment	/
13	University of Nova Gorica	Faculty of Environmental Studies	/	Environment	Environment	/
14	Independent higher education institution	Higher Professional School for Environmental Protection	Environmental Protection	/	/	/
15	Independent higher education institution	Higher Professional School for Sustainable Development, Kranj	Environmental Protection	/	/	/

5. BEST PRACTICES

5.1. CargoX

CargoX (CargoX, 2019) is the independent supplier of blockchain-based Smart Bill of Lading solutions that provide an extremely fast, safe, reliable, and cost-effective way to process Bills of Lading anywhere in the world. CargoX has developed a decentralised platform based on the network and has a pipeline of future products for the supply chain industry.

CargoX aims to transport the global shipping industry by securing Bill of Lading documents using blockchain technology. They provide a way for importers and exporters to exchange these documents digitally, securely, and with no possibility of fraud in a neutral environment – extremely quickly and much more affordable that currently.

Bills of Lading are the most important document in the global logistics industry. Bill of Lading is a mandatory document issued at the port of departure for every container boarding an ocean cargo ship. Every year, millions of paper Bill of Lading documents are issued. Unfortunately, paper Bill of Lading documents themselves must be shipped all over the world, which is the root cause of many of the challenges plaguing the supply chain industry:

(1) Slow – these paper documents need to be sent from the exporter to importer, and have an average travel time of more than a week while swapping hands between 2-3 courier delivery service,

(2) Lost- the process to resolve a damaged, lost, stolen Bill of Lading document is a complete bureaucratic nightmare and takes over 20 days to re-issue a replacement Bill of Lading,

(3) Cost – issuing and transporting one paper Bill of Lading document costs up to $180.

CargoX's Smart Bill of Lading solution based on the public Ethereum blockchain completely replaces old-school paper Bill of Lading documents and drives extremely fast, safe, reliable and cost-effective processing of Bills of Lading – anywhere in the world. CargoX's Smart Bill of Lading was publicly demonstrated at the 8th International Logistic Congress on 12 April 2018.

CargoX Smart Bill of Lading is the world's first and the only working open blockchain based Bill of Lading solution available today.

The blockchain-based Bill of Lading developed by CargoX preserves all of the legacy features of paper Bills of Lading and takes them a step further with the benefits offered by the decentralised platform, including security, cost reduction, and fast delivery (Figure 19).

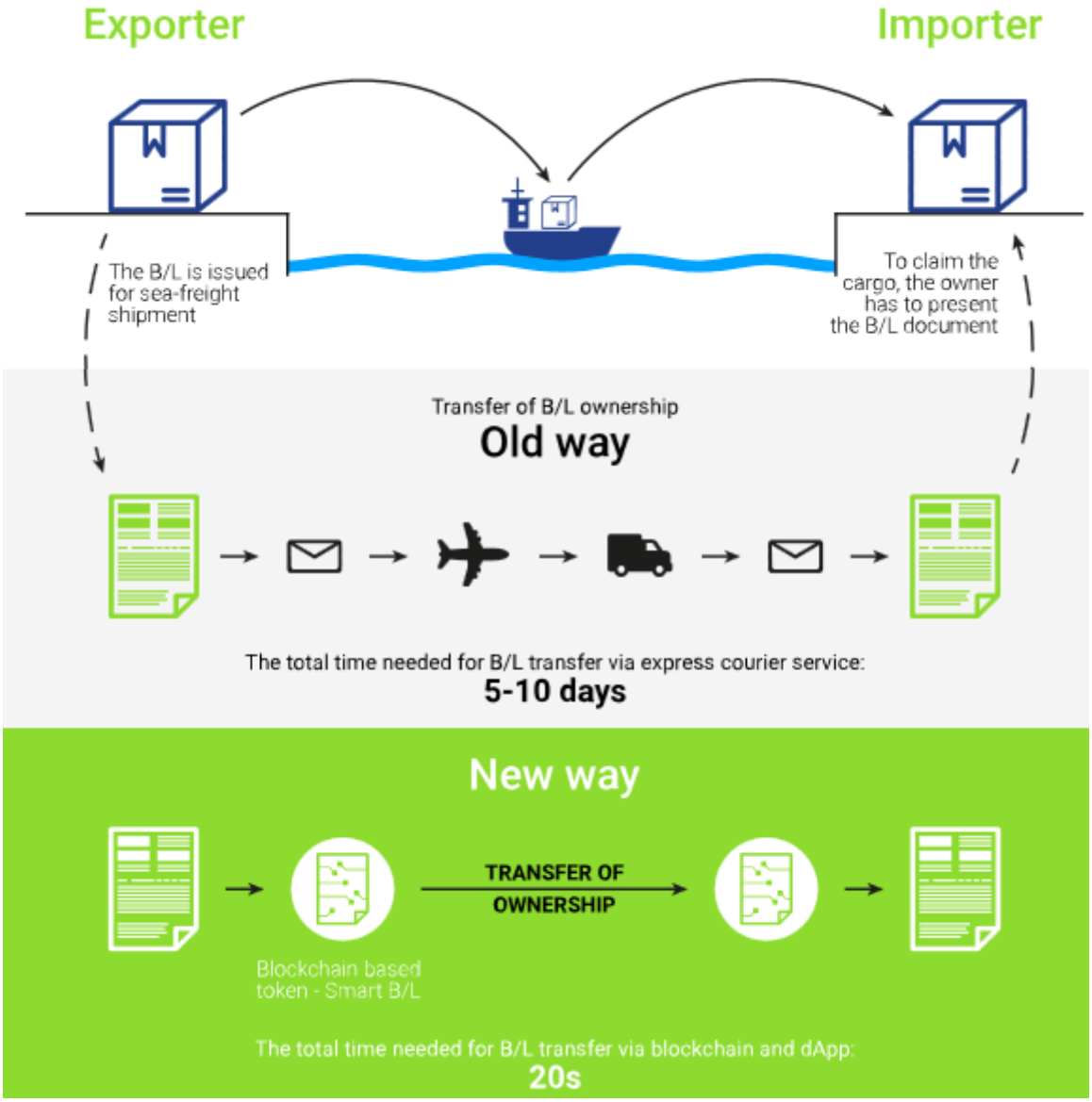


Figure 19: Comparison between paper Bill of Lading and Smart Bill of Lading (CargoX, 2019).

Benefits of Smart Bill of Lading solution:

(a) Security – blockchain has no central storage that can be attacked by hackers,

(b) Fast delivery – Smart Bills of Lading are issued instantly and are immediately available to the exporter – just like sending an email.

(c) Cost reduction – Smart Bill of Lading solution saves shippers and consignees up to 100 % of their courier and postal costs.

(d) Paperless – the blockchain-based Smart Bill of Lading does everything that a paper one does, but is completely eco-friendly, with less printing, etc.

(e) Tracking and storing – every transaction is traceable. The sequence of events is clearly defined and forever written on the blockchain.

The CargoX main development office is located in Ljubljana, Slovenia, but they have a supervisory and strategic office in Hong Kong.

5.2 Pošta Slovenije

The specificity of the Pošta Slovenije fleet vehicle is in adapting the fleet vehicle to the services that Pošta Slovenije performs and the territory on which these services are performed (regulated roads, urban centres, agglomerations, hard access roads and unregulated areas). Therefore, for providing services in shipments' delivery (packet, letter, etc.), in comparison with other users of these vehicles, they are more burdened with numerous stops and spin-offs in shorter routes. These vehicles are mainly used for delivery of door-to-door. When purchasing vehicles, Pošta Slovenije takes into account the terrain where these vehicles will be used, and therefore important driving characteristics of these vehicles, vehicles dimensions, wheelbase, turning radius, front and rear overhangs, drive, etc.

When choosing vehicles, Pošta Slovenije pays a lot of attention to fuel consumption, releases of polluting emissions to the environment, and, the economic viability of using a particular vehicle in a given territory or for a specific provision of services. Efforts to use alternative energy sources for the propulsion of vehicles for providing services in the Pošta Slovenije are aimed at increasing the share of such vehicles within the entire fleet vehicle.

Pošta Slovenije fleet vehicles consume over four million litres of petroleum products; four-wheel vehicles use most of which, more than 85%. Into the atmosphere is released about 3 kg of carbon dioxide with each kilogram of fuel. Thus in the field of efficient environmental performance in the Pošta Slovenije, a strategy was adopted on the ecological efficiency of transport, which shows the potential for a long-term reduction in annual greenhouse gas emissions and fleet vehicle costs by 2030.

An important turning point in the field of environmental protection was 2010 when first light electrically powered vehicles were introduced into the fleet vehicle of Pošta Slovenije. The year before, electric bicycle replenished fleet vehicle. Since the introduction in 2009, the number of electric bikes is increasing.

As a company with a large fleet vehicle, they pay attention to training drivers on ecologically driven driving. In this way, they raise the level of awareness for environmental protection of our responsibility to the environment, both within the company and outside the company. They ensure that new transport vehicles driven by fossil fuels meet the highest environmental standards.

They also made calculations for the return of the fleet vehicle replacement investment in 2010, based on the anticipation of the annual increase in ecological vehicles and the reduction of classic vehicles in the Pošta Slovenije fleet vehicle. Calculations for 15 years showed that the fleet's operating cost (fuel, amortisation, and maintenance) would first increase (in the first 5-year period), then stabilise, and at the end of this period reduce.

They introduce the use of Piaggio Porter Electric's lightweight delivery vehicle (Figure 20) in some cities (Piran, Portorož, Ljubljana), where the delivery by conventional vehicles is disabled or legally prohibited. This electric car is small and therefore suitable for delivery in city centres, where narrow streets are also hindered.

Figure 20: Piaggio Porter Electric vehicle (Pošta Slovenije, 2018).

The ecological fleet vehicle (Figure 21) of Pošta Slovenije currently has 5 light electrically powered vehicles, 60 delivery cars with liquefied petroleum gas, 60

electrically powered motors bikes and 20 electrically powered scooters. Pošta Slovenije constantly endeavours to obtain the highest quality information on the possibilities of using more environmentally friendly vehicles. They often carry out tests of different types of vehicles that they could use in the future for their activities.

Figure 21: Pošta Slovenije's fleet vehicle (Pošta Slovenije, 2018).

REFERENCES

3 PROJEKT. (n.d.). Retrieved from https://www.3projekt.si/.

Andragoški center Republike Slovenije. (n.d.). Retrieved from https://www.acs.si/.

ARSO. (2016). *ARSO okolje: Kazalci okolja.* Retrived from http://kazalci.arso.gov.si/sl/content/izpusti-toplogrednih-plinov-iz-prometa-4.

Ba. P., Delo.si. (21 Mar. 2011.). *Največja sončna elektrarna v Ljubljani. Delo.si.* Retrieved from https://www.delo.si/novice/slovenija/najvecja-soncna-elektrarna-v-ljubljani.html (12.05.2019).

Bahovec, M. (2016). Informacijska podpora skladiščnega poslovanja v izbranem podjetju. Ljubljana: B&B Višja Strokovna Šola.

Beškovnik, B. and Twrdy, E. (2012). Green logistics strategy for South East Europe: To imporve intermodality and establish green transport corridors, *Transport*, 27 (1), 25-33.

CargoX. (2019). Retrieved from https://cargox.io/.

Dogovor v zvezi z izboljšanjem pogojev na področju avtoprevozniške dejavnosti. (2018). Retrieved from https://www.gzs.si/Portals/Panoga-Zdruzenje-Promet/DogovorMZI-GZS-OZS_SEKTOR_PREVOZNISTVO_20180516.pdf.

Doktorski študijski program. (n.d.). Retrieved from http://fl.um.si/studij/studijski-programi/doktorski-studijski-program/.

Eko sklad, javni poziv. (n.d.). Retrieved from https://www.ekosklad.si/ pravne-osebe/javne-objave/prikazi/publicationID=33.

Eko sklad, o skladu. (n.d.). Retrieved from https://www.ekosklad.si/o-eko-skladu/ o-skladu.

Emmerson. (2017). *Green and Sustainable Packaging. Emmersonpackaging.com*. Retrieved from https://www.emmersonpackaging.com/sustainability/ green-and-sustainable-packaging/.

Emigma. (2017). *Po desetih letih novo skladišče. Luka Koper.* Retrieved from https://luka-kp.si/slo/novice/single/po-desetih-letih-novo-skladisce-11570 (12.05.2019).

EOL 2018/6. Zelenaslovenija.si. Retrieved from http://www.zelenaslovenija.si/ images/stories/eol/EOL_127/EOL_127.pdf.

EOL 2018/7. Zelenaslovenija.si. Retrieved from http://www.zelenaslovenija.si/ images/stories/eol/EOL_129-130/EOL_129-130.pdf.

EUR-Lex, Environment and climate change. (n.d.). Retrieved from https://eur-lex.europa.eu/summary/chapter/environment.html?root_default=SUM_1_CODED%3D20.

European Enviroment Agency. (2018). *Annual European Union greenhouse gas inventory 1990–2016 and inventory report 2018*. Brussels, B: European Commisson.

Grebenc, M. (2014). *Fleet mamagement systems*. Ljubljana: Univerza v Ljubljani.

GS1 Slovenija. (n.d.). Retrieved from https://www.gs1si.org/.

Hribar Milič, S. (ur). (2018). *Transport: Glas gospodarstva.* Ljubljana, SI: GZS.

Invest Slovenia. (n.d.) *Industries: Logistics & Distribution.* Retrived from: https://www.investslovenia.org/industries/logistics-distribution/

Jedlinski, M. (2014.). The position of green logistics in sustainable development of a smart green city. *Procedia-Social and Behavioral Sciences*,151, 102-111.

Kranjc, S. (2008). *Logistika ostankov iz proizvodnje in prodaje.* Retrieved from https://akademija.finance.si/223692?cctest&.

Logistični kongres. (n.d.). Retrieved from http://www.logisticnikongres.si/.

Magistrski študijski program. (n.d.). Retrieved from http://fl.um.si/studij/studijski-programi/magistrski-studijski-program/.

Management transportne logistike (VS). (2015). Retrieved from http://www.arema.si/si/651/Management_transportne_logistike_VS.aspx.

Merkur-nepremičnine. (n.d.). *Dogodki v centrih. Merkurnepremicnine.si.* Retrieved from https://www.merkurnepremicnine.si/dogodki-v-centrih/ (12.05.2019).

Ministrstvo za gospodarski razvoj in tehnologijo. (2019). *Cene naftnih derivatov.* Retrieved from http://www.mgrt.gov.si/si/delovna_podrocja/notranji_trg/nadzor_cen_naftnih_derivatov/cene_naftnih_derivatov/.

Močnik, D. (2016). Transportna podjetja za 2017 še bolj optimistična. *Transport 2016*. Ljubljana: GZS.

Nacionalna poklicna kvalifikacija. (2015). Retrieved from http://www.npk.si/.

Pavlin, C. (2013). Gospodarstvo. Močno nam primanjkuje sodobnih skladišč. Delo.si. Retrieved from https://www.delo.si/gospodarstvo/posel/mocno-nam-primanjkuje-sodobnih-skladisc.html

Poklicno-tehniško izobraževanje. (n.d.). Retrieved from http://www.cpi.si/poklicno-tehnisko-izobrazevanje.aspx.

Pomorstvo. (n.d.). Retrieved from https://www.fpp.uni-lj.si/studij/2-stopnja/promet/#Transportna_logistika.

Poslovna logistika. (n.d.). Retrieved from http://www.ef.uni-lj.si/podiplomsko/poslovna_logistika.

Poslovna logistika-usmeritev študijskega programa VPŠ. (n.d.). Retrieved from http://www.ef.uni-lj.si/dodiplomsko/vps_poslovna_logistika.

Poslovna logistika-usmeritev študijskega programa UPEŠ. (n.d.). Retrieved from http://www.ef.uni-lj.si/dodiplomsko/upes_poslovna_logistika.

Pošta Slovenije. (2018). Retrieved from https://www.posta.si/zasebno.

Promet. (n.d.). Retrieved from https://www.fpp.uni-lj.si/studij/2-stopnja/promet/#Transportna_logistika.

Prometna tehnologija in transportna logistika. (n.d.). Retrived from https://www.fpp.uni-lj.si/studij/1-stopnja/prometna-tehnologija-in-transportna-logistika-(vss)/.

Resolution on the National Programme for the Development of Transport in the Republic of Slovenia. (2017). Retrieved from http://www.mzi.gov.si/fileadmin/mzi.gov.si/pageuploads/DPR/Prometna_politika/17_11_21-RESOLUCIJA-E.pdf.

SAP (2019). *SAP documentation: Transport Load Optimisation*. Retrived from: https://help.sap.com/saphelp_scm700_ehp04/helpdata/en/36/31dfdd08514ba780e9217e08bd77a6/frameset.htm.

Sever, R. (2017). *Kaj bodo imele skupnega inteligenca, digitalizacija in napredna logistika?* Ljubljana: GZS.

Skaza (n.d.). BOKASHI ORGANKO 2 - Plastika Skaza d.o.o.. Skaza.si. Retrieved from https://www.skaza.si/nasi-izdelki/bokashi-organko-2

Slovensko logistično združenje. (n.d.). Retrieved from http://www.slz.si/sl/.

Slovenian Logistic Association. (n.d.) *Suplay chain mangement in Science and Practise 2019. Retrived from: http://www.logisticscongress.eu/*

Srednje strokovno izobraževanje. (n.d.). Retrieved from http://www.cpi.si/srednje-strokovno-izobrazevanje.aspx.

SRIP 2019. *SRIP Pamenta mesta in skupnosti: Mobilnost, transport in logistika.* Retrived from: http://pmis.ijs.si/sl/mobilnost-transport-in-logistika/

SURS 2019. Retrieved from https://www.stat.si/StatWeb/en/News/Index/7718.

TechTarget (2019). *Strategies for SAP ERP integration with other business applications*. Retrived from: http://searchsap.techtarget.com/feature/Strategies-for-SAP-ERP-integration-with-other-business-applications.

Tehnologija prometa in logistika. (n.d.). Retrieved from https://www.fpp.uni-lj.si/studij/1-stopnja/tehnologija-prometa-in-logistika-(u)/.

The World Bank. (2019), *Country Score card: Slovenia* Retrieved from https://lpi.worldbank.org/international/scorecard/radar/254/C/SVN/2016/C/SVN/2014/C/SVN/2012/C/SVN/2010/C/SVN/2007#chartarea.

Tudi transportne poti je treba optimizirati. (2019). Retrieved from https://www.delo.si/mobilnost/tudi-transportne-poti-je-treba-optimizirati-157843.html.

Univerzitetni študijski program. (n.d.). Retrieved from http://fl.um.si/studij/studijski-programi/univerzitetni-studijski-program/.

Uredba o določitvi zneska trošarine za energente. (2010). Uradni list RS, no. 26/10 (30.03.2010). Retrieved from http://pisrs.si/Pis.web/pregledPredpisa?id=URED5469

Uredba o letni dajatvi za uporabo vozil v cestnem prometu. (2018). Uradni list RS, no. 23/18 (06.04.2018). Retrieved from http://www.pisrs.si/Pis.web/pregledPredpisa?id=URED7631.

Uredba o odpadkih. (2015). Uradni list RS, no. 37/15 (29.05.2015). Retrieved from http://www.pisrs.si/Pis.web/pregledPredpisa?id=URED7011.

Uredba o ravnanju z embalažo in odpadno embalažo. (2006). Uradni list RS, no. 84/06 (08.08.2006). Retrieved from pisrs.si/Pis.web/pregledPredpisa?id=URED5469.

Uredba o zagotavljanju prihrankov energije. (2014). Uradni list RS, no. 96/14 (29.12.2014). Retrieved from http://www.pisrs.si/Pis.web/pregledPredpisa?id=URED6636.

Ustava Republike Slovenije /URS/ (1991). Uradni list RS, no. 33/91 (28.12.1991). Retrieved from http://pisrs.si/Pis.web/pregledPredpisa?id=USTA1.

Visokošolski strokovni študijski program. (n.d.). Retrieved from http://fl.um.si/studij/studijski-programi/visokosolski-strokovni-studijski-program/.

Višješolski študijski program. (n.d.). Retrieved from http://www.cpi.si/visjesolski-studijski-programi.aspx.

Vlada RS. (2018). Zelena proračunska reforma, Okoljski in javnofinančni vidik spodbud v Sloveniji. Retrieved from http://www.mf.gov.si/fileadmin/mf.gov.si/pageuploads/javne_objave/2018-sept-P3_ZelenaProracunskReforma_2_.pdf.

Za spremembe so potrebni znanje, želja in moč. (2014). Retrieved from https://www.delo.si/gospodarstvo/posel/za-spremembe-so-potrebni-znanje-zelja-in-moc.html.

Zafran, N. (2017). *Management trajnostnih oskrbovalnih verih in zelena logistika. (*Master Thesis), Ljubljana: Universty of Ljubljana.

Z*elena rast gospodarstva.* (n.d.). Retrieved from http://www.vlada.si/teme_in_projekti/prehod_v_zeleno_gospodarstvo/ukrepi/zelena_rast_gospodarstva/.

Zelena Slovenija. (2019). *Jugovzhodna Evropa pred izzivi zelene logistike-EOL 66*. Retrived from https://www.zelenaslovenija.si/revija-eol-/aktualna-stevilka/logistika/1488-jugovzhodna-evropa-pred-izzivi-zelene-logistike-eol-66.

Zakon o dajatvah za motorna vozila /ZDajMV/ (2017). Uradni list RS, no. 54/17 (29.09.2017). Retrieved from http://www.pisrs.si/Pis.web/pregledPredpisa?id=ZAKO6437.

Zakon o davku na motorna vozila /ZDMV/ (1999). Uradni list RS, no. 72/06 (30.06.1999). Retrieved from http://pisrs.si/Pis.web/pregledPredpisa?id=ZAKO1276.

Zakon o prevozih v cestnem prometu /ZPCP-2/ (2016). Uradni list RS, no. 6/16 (14.12.2006). Retrieved from http://pisrs.si/Pis.web/pregledPredpisa?id=ZAKO4236

Zakon o trošarinah /ZTro-1/ (2016). Uradni list RS, no. 47/16 (01.07.2016). Retrieved from http://www.pisrs.si/Pis.web/pregledPredpisa?id=ZAKO7128

World Economic Forum – WEF, *The Global Competitiveness Report 2018*. Genève, WEF (2018).