При реализации программ по развитию Дальнего Востока целесообразно перенимать «соседский опыт» и тогда, возможно, через 5-6 лет Забайкальск станет прямым конкурентом Маньчжурии.

Таким образом, можно сказать, что чтобы добиться эффективного торгового приграничного сотрудничества России и Китая, а также выхода данных отношений на инновационно-инвестиционный уровень, на наш взгляд, необходимо:

- стимулирование развития сотрудничества приграничных районов со старыми приграничными базами северо-востока Китая;
- увеличение поставок в Китай топливно-энергетических ресурсов в обмен на китайские инвестиции и инновации;
- создание зон свободной торговли в российских городах на границе с Китаем;
- разработка и принятие закона о совместных предприятиях России и Китая в приграничных районах;
- реорганизация и реставрация транспортной и трансграничной инфраструктуры;
- ослабление российской фискальной политики для малого бизнеса Дальнего Востока;
- разработка и реализация совместной программы России и КНР о технико-экономическом развитии и сотрудничестве;
- оптимизация структуры российского экспорта за счет повышения доли продукции машиностроения и товаров с более высокой добавленной стоимостью;
- побуждение и поощрение российских предприятий для реставрации старых предприятий, пропускных пунктов;
- создание на территории РФ комплекс перерабатывающих предприятий, которые позволят экспортировать вторичное сырье;
- создать каталог инновационных российских товаров на китайском языке.

1. Го Лиан Чэнь. Исследования российских внешнеэкономических связей / Го Лиан Чэнь. – Пекин: Экономические науки пресс, 2005. – 357 с.
2. СюйЧжаоЦзе. Торгово-экономическое сотрудничество между Китаем и Россией /СюйЧжаоЦзе// Сибирское исследование. – 1995. - № 5. – С. 5–8.
3. Три подхода к российско–китайским отношениям [Текст] // Обозреватель. – 2013.– №14, – С. 74– 79. – ISSN 0356 – 4562.
4. Портяков, В.Я. Российско–китайские отношения в 2008–2009 годах [Текст] / В.Я. Портяков. – Москва: [б. и.], 2011. – С. 73–78. – ISBN 5 – 5632– 4236.

Krylova N.I.
Indicative food wastemanagement

*University of Geneva
(Switzerland, Geneva)*

doi: 10.18411/gdsn-25-12-2017-19

idsp: 000001:gdsn-25-12-2017-19

One of the paradoxes of modern world is that along with the continuous advancement of scientific and technological progress, combined with increasing opportunities for production and consumption processes, arises the problem of waste, which is growing rapidly and undoubtedly becoming a global threat to mankind. The total mass of waste that arises from the human economic and intellectual activities amounts to about 3 billion tons per year, or 1.2 kilograms per person, on average, per day. Of this waste, about 40% is organic waste, mainly substances of plant and animal origin. [6] According to a study by the Food and Agriculture Organization of

the United Nations (FAO), nearly one third of all food products is lost or thrown away - approximately 1.3 billion tons per year.[1]

Food waste forms the bulk of municipal solid waste (MSW) or household waste, the mass of which grows particularly quickly. In Russia, an estimated 60 million tons of solid waste is added every year. In terms of per capita waste production, the mass of solid waste for the period 2000-2010 increased from 360 kg to 450 kg per year.[6] Recycling rate is particularly low at about 5% and the main mass of solid waste is dispatched in open dumps and landfills [4]. The number of landfills and dumps in Russia is not known exactly, but is estimated at tens of thousands. Waste is exported from the country's cities often in non-compliance with norms, standards and laws, which poses a serious threat to human health and has a devastating effect on natural ecosystems.

Objectively, the urgent and growing problem of waste, both in the sphere of production and in the sphere of consumption, gives an exhaustive, in our opinion, explanation for the urgency of formation of an integrated waste management system. It should be holistic and provide integral interconnectedness of all elements and functions of the system, starting from normative and technical regulations to the rules and norms governing people's behaviour in the natural, industrial, technological and public spheres.

The methodology for the food waste management system developed in this article is based on the experience of indicative planning and management of economic processes, which has accumulated in countries with developed market economies. The general methodological basis for the formation of such a system is to ensure its integrity, not only by its constituent elements, but also at different levels, taking into account the differences and interconnection of waste indicators at the global, country and regional levels and at the level of individual industries and enterprises. Given these circumstances, the approach may not solely be based on the directive but has to be that of indicative management, based on a system of indicators with corresponding level of regulation and management.

The conceptual origins of indicative planning and management are found in the work of such economists of institutional orientation as F. Perroux (France), J. Tinbergen (Netherlands), G. Myrdal (Sweden). In the systemic form, indicative planning is presented in K. Landauer's Theory of National Economic Planning.

In modern interpretation, indicative planning is the activity of state bodies in drawing up indicative plans informing all interested economic entities of the state's long-term objectives for social and economic policy, possible trajectories of economic dynamics and appropriate measures to achieve growth. The availability of such plans-forecasts for corporations, enterprises and entrepreneurs allows them to better orient themselves in the constantly changing economic situation when developing their own plans for the medium and long term. Indicative plans operate with indicators, referring mainly to the macroeconomic level, which are established in the form of corridors with a lower and upper limit and are of a vector nature. [5]

Arguably, it may be a great simplification to reduce indicative planning and management only to the state and macroeconomic level. Indicative nature may have sectorial and regional plans and programs, or even plans for parent companies that orient subsidiaries in their own planning. The same can be said for supranational bodies, for example, bodies of the European Union, in their relations with the states that are members of these associations. The EU directives largely perform the functions of indicative management. Finally, we cannot fail to mention the indicators of the global level used, for example, by the United Nations in developing the program of Sustainable Development Goals for the period up to 2030. [3]

The notion of the indicator itself needs clarification. In our opinion, the indicator expresses a special functional purpose, which consists in expanding the degree of freedom of actions of the controlled object within a certain interval. In contrast to the directive indicator fixing a certain moment or point, the dynamic indicator determines the interval or a segment of the trend (economic, investment, innovation, etc.), set from a higher level for lower-level orientation in decision-making, which to some degree are consistent between each other.

A scientific and practical approach that can be implemented in the concept of indicative food waste management is presented in the report of the The High Level Panel of Experts on Food Security and Nutrition (HLPE) mentioned above. In the synthesis, authors of the report describe food waste management as part or an element of a wider system, which also includes food losses as a management object. The difference between food losses and food waste is seen in the fact that the former arises before the stage of consumption, and the latter arises in the process of consumption and/or as a result of it. Together, food losses and food waste (FLW) is understood as "reduction in the volume of food intended for human consumption at all stages of the food chain from harvesting to consumption." [1, p.11]

The above-mentioned report by HLPE defines food losses as the losses of food products intended for human consumption that occur starting from the production stage moving forward to the final consumer, which, can be interpreted as food waste on its own.

The most significant result of the report is, in our opinion, the development of a methodology for measuring food waste on a global scale, covering all regions of the world. [2] According to the study, food losses and food waste per capita in different regions of the world are distributed as follows:

FLW per capita in different regions of the world kg / person / year

Given the value of the data on the per capita distribution of FLW across regions and countries, it is not sufficient for indicative planning and management of the waste generation in the food sector. These indicators merely fix the existing state, and from the point of view of orienting and stimulating effect on the management object, their significance is extremely limited. In order to give these indicators a dynamic character, they should be linked to the main indicator of the dynamics of public production, in our concept - with the Gross Domestic Product (GDP).

The ratio of the value of FLW to GDP we define as the index of the specific economic burden of food losses and food waste in the food sector:

$$N = \text{FLW} / \text{GDP}$$

At present, world science and practice do not have more reliable estimates of the volume of food losses and food waste than was made on the basis of the methodology of the FAO study (2011a). Neglecting, for the time being, possible changes in these estimates over the past period, the index of the world economy's specific burden of food losses and food waste as of 2017 can be calculated from the following ratio:

$$N = 1300000 / 76672787 = 0.017 \text{ tons / dollar}$$

Here in the numerator is the size of food losses and food waste measured in millions of tons, calculated according to the methodology of FAO (2011a); the size of world GDP according to 2017 in millions of dollars is reflected in the denominator.

The result obtained may seem negligible, which, perhaps, is one of the explanations why the struggle against waste and losses in the food industries (and not only) is unsatisfactory in almost all countries. Nevertheless, one cannot help but understand that out of these 17 kg per dollar, already a billion-ton mass of food losses and food waste is generated in the world on an annual basis. The main purpose of this indicator in the system of indicative management is to show the place and rank of the country (state, region) as a participant in the global rise to the trajectory of sustainable development, including, in particular, in terms of high-quality, affordable and economical nutrition. The inclusion of the proposed methodology in the scientific and practical circulation reveals a picture that contrasts sharply with the regionally averaged FLW indicators, calculated by the HLPE methodology. Judging by these indicators, the USA and Russian Federation are at almost the same ranking level - 296 kg in the USA and 281 kg in the Russian Federation. But here's how these two countries differ by the index of FLW to the corresponding GDP:

$$\begin{aligned} \text{USA: } N &= 296 \times 323 / 18153487 = 0.0053 \text{ kg / USD} \\ &323 - \text{population, million people, 2017} \\ &18153487 - \text{GDP, million dollars, 2017} \end{aligned}$$

$$\begin{aligned} \text{Russian Federation: } N &= 281 \times 147 / 1425703 = 0.029 \text{ kg / USD} \\ &147 - \text{population, million people, 2017} \\ &1425702 - \text{GDP, million USD, 2017} \end{aligned}$$

The calculation shows that the burden of food losses and food waste on the Russian economy is more than five times (more precisely, 5.5 times) higher than the corresponding figure in the United States. It is important to note that population, being the main producer of food waste, in the USA is more than twice that of in Russian Federation.

The absolute value of the waste burden on the economy index in a given country does not yet give an adequate idea of the rank of this country in the rating of the waste generation. Much more representative is the reciprocal of this index $R = 1 / N$, which in its meaning is nothing more than an index of the recreational sustainability of the economic system to the effects of food losses and food waste. The smaller the waste burden on the country's economy and its various branches (the aggregate of industries), the greater is the economic resilience to waste generation. In our example, the recreational sustainability of Russia is 5.5 times lower than in the USA.

The concept of recreation (from Latin *recreatio* - recovery, recreation, renew) has a much broader meaning than, for example, the recreational zone, intended for people's health and tourism. For some countries, and Russia is not an exception, it should not only presume the recreation of individual recreational zones, but rather the recreation of the entire territory of the country, "littered" with industrial and domestic landfills, burdened with swamped, or, conversely, dehydrated lands, rotting and burnt forests, poisoned rivers, polluted air etc. The situation is now reaching such a scale that it is time to think about the recreation of the entire planet.

If we adopt the index of the anti-waste sustainability of a country for a unit, then all other countries can be ranked by this index.

The algorithm of ranking of countries by the index of recreational sustainability to waste in the food sector may be derived by the following steps:

1. Systematization of the initial data for the calculation of the index:
 - size of GDP, million USD
 - population, million people
 - total amount of food losses and food waste (FLW), million kg

Data sources used - official national statistics as well as evaluations and results of various studies on the volumes of the FLW.

2. The burden on the economy of FLW is calculated according to the formula:

$$N = \text{FLW} / \text{GDP kg} / \text{USD}$$

3. The index of recreational sustainability is calculated as an inverse value:

$$R = 1 / N \text{ USD} / \text{kg}$$

4. Nomination of the index of recreational sustainability of the country-leader as a unit of rating ranking.
5. Then is formed the ranking of countries' economic resilience to food losses and food waste according to their index of recreational sustainability.

Index of recreational sustainability of some countries' economies to FLW, 2016

Ran k	Country	GDP USD mln	Populatio n mln	FLW mln kg	FLW burden on the economy N=FLW/GDP kg/USD	Index of recreational sustainability R= 1/N USD/kg	Nomina l value of R- indexUS D/kg
1	Norway	430823	5,2	1470,5	0,00341	295	1
2	Switzerland	680113	8,37	2352	0,00346	290	0,983
3	Luxemburg	44691	0,583	163,8	0,0037	270	0,915
4	USA	18153487	323,1	95637	0,0053	188,7	0,64
5	Sweden	540960	9,9	2782	0,005	200	0,68
6	Hong Kong	317690	7,35	1435	0,0055	182	0,60
7	Finland	245784	5,5	1545	0,006	167	0,56
8	Japan	4825207	127,0	29972	0,0062	161,3	0,55
9	Germany	3609439	82,7	23239	0,0064	156,2	0,53
10	Great Britain	2782338	65,6	18445	0,0066	151,0	0,51
11	France	2605813	66,9	18738,9	0,0072	138,9	0,47
12	UAE	375190	9,27	2002	0,008	1256	0,42
13	South Korea	1414400	51,25	12095	0,0085	117,6	0,40
14	Argentina	524532	43,85	9778	0,0186	53,7	0,182
15	Brazil	1835993	207,7	46,317	0,025	40	0,135
16	China	11393571	1379	325444	0,0286	35,0	0,119
17	Russia	1425703	147,0	41307	0,029	34,5	0,117
18	South Africa	306555	55,9	9335	0,03	33,3	0,113
19	India	2220043	1324	166824	0,075	13,3	0,045
20	Pakistan	291845	193,2	24343	0,083	12,0	0,04

In the above-mentioned group of countries ranked by the index of recreational sustainability, food losses and food waste data was obtained from the FAO study (2011a). Consequently, the data is correlated to the GDP and population size as of the year 2016, as science and statistics do not have more accurate and reliable information about the volumes and dynamics of food losses and waste.

We can not fail to note the fact that the index of recreational sustainability is highly correlated with the index of country competitiveness, the index of human development, the quality index of public administration and other indices by which leading research centres and international organizations monitor the rating position of countries in the global community. The first country in our ranking is Norway, which also holds leading positions in the level of education, life expectancy and household income. The same can be said about Switzerland, France,

Germany, the USA and other highly developed countries. The reliability of our methodology for measuring recreational sustainability is also confirmed by comparative assessments of the effectiveness of national institutions regulating waste management rules and regulations in their countries. [4]

Certainly, the rating place of each of the listed countries will change, as new ones will be added to the list with the use of the corresponding statistics. It should also be noted that the amount of food waste at the national level, as a rule, differs from the regional average of food waste that appears in the assessments of FAO. In countries with very low GDP per capita, the FLW burden on the economy index may be incredibly high, suggesting that the regional average is inadequate for a given country. One cannot ignore the fact that in many of less developed countries the main source for low amount of food waste is still hunger and the availability of food in general.

In a broader generalization, we can state an inverse relationship between the level of economic development and the comparable (per capita) size of food losses and food waste in the intercountry and interregional sections. Within the framework of this dependence, the internal structure of the FLW is formed, shifting either towards food losses or towards food waste at different stages of production and consumption of food. In more developed countries, a large proportion of food waste is added in the final consumption stage; less developed countries, most commonly agrarian countries, by virtue of technological backwardness, suffer losses in food at the stage of harvesting and subsequent stages of production and post-harvesting (i.e. storage), but are forced to save in food consumption.

Distribution of FLW at different steps of the food supply chain in different regions of the world (in % of the original food)

Regions and countries \ Supply chain step	Harvest	Post-harvest processing	Production and packaging	Distribution	Consumption
1. North America, Oceania	10,5	3,5	3,4	2,4	12,6
2. Europe, including Russia	11,3	3,4	3,9	2,2	10,6
3. Japan, South Korea, China	9,0	6,6	3,2	4,4	10,3
4. Latin America	13,4	7,5	6,0	4,1	3,7
5. North Africa, West and Central Asia	10,8	7,8	6,3	5,6	5,5
6. Sub-Saharan Africa	12,5	12,7	4,5	4,6	1,3
7. South and SW Asia	8,7	9,6	2,7	4,6	2,6

Source: based on the data from Gustavsson et al (FAO 2011a)

The task of improving the methodology for measuring waste and establishing statistical records in this area, of course, is strongly advocated. More stringent requirements should be applied to indicators designed to regulate the movement and sanitation of waste at the level of states, regions, municipalities, as well as corporations and enterprises. If, at the global level, such indicators reflect, primarily the prestige and reputation of a country in the world community, then the motivational effect of these indicators should be taken into account from the top down approach, meaning the stimulation of both encouraging and coercive actions.

Of course, it is not necessary that approaches to waste management, including at the level of individual regions of the country and enterprises, should be unified. Nevertheless, in our opinion, it is necessary to strive to ensure that the relevant normative documents and methodologies are based on the most accessible and simple criteria and indicators. At the regional level, the waste burden index, calculated as the ratio of the volume of FLW to the regional gross product (RWP), can be used as an adequate indicator to this requirement. At the enterprise level, for a report point, one can take the ratio of the value of food losses and food waste to the volume of revenue. Starting from generalized indicators, it is easier to construct a

logically integrated system of indicators that reflect the effectiveness of local government and enterprise in waste management.

In the Russian Federation there already exists some experience of interaction of federal authorities and entities of the Russian Federation with use of principles of indicative management. In accordance with the Decree of the President of the Russian Federation of 11/21/2012 N 1199 "On assessing the effectiveness of executive bodies of the constituent entities of the Russian Federation", senior officials of the constituent entities of the Russian Federation are required to submit annual reports to the federal government on the progress achieved in the current period of planned targets adopted for a three-year period. A methodology and a list of indicators for assessing effectiveness has been developed, as well as the procedure for providing grants to those leading entities of the Russian Federation in the form of interbudgetary transfers in order to promote best practice and achievements.

The proposed methodology will make it possible to rank the entities of the Russian Federation in terms of the waste burden on the economy and recreational sustainability indices in the food sector, monitor the performance of the entities in terms of the dynamics of these indices, make managerial decisions and take actions on a systematic and orderly basis. In turn, the authorities of the constituent entities of the Russian Federation and local authorities will be able to rank enterprises and corporations located on their territory according to the waste index, not only using the polluter-pays principle, but also by encouraging best practice. Taking into account the geographic specificity of Russia, one should not lose sight of the difference in natural and climatic conditions when ranking regions and enterprises based on the index of the burden of the FLW and recreational sustainability.

In essence, the proposed system can become a universal tool for combating waste in any sphere of production and consumption. The underlying feature is to develop an effective measurement system, establish accounting and gather accurate statistics.

1. Food losses and waste in the context of sustainable food systems, The High Level Panel of Experts on Food Security and Nutrition, 2014 <http://www.fao.org/3/a-i3901e.pdf>
2. Gustavsson, J., Cederberg, C., Sonesson, U., Emanuelsson, A. The methodology of the FAO study: global food losses and food waste – extent, causes, prevention, 2011 www.fao.org/docrep/014/mb060e/mb060e.pdf 2011
3. United Nations. Transforming our world: the 2030 Agenda for Sustainable Development, New York, 2015. <https://sustainabledevelopment.un.org/post2015/transformingourworld/publication>
4. Krylova N. Waste Management in the production and consumption. Institutional aspect. Economics and management: problems, solutions. 06-1, 2016
5. Tkachenko, A.A. Indicative Planning <http://knowledge.su/indikativnoe-planirovanie>
6. Hoonweg D., Bhada-Tata P. What a waste. A Global Review of Solid Waste Management. March 2012. <http://bit.ly/1h5ZAC6>