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Responsabil de număr: Mădălina Anghel

Studiu privind evoluția proceselor demografice din România

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Abstract

Schimbările demografice dintr-o țară impactează evoluția economiei naționale, având efecte directe asupra sistemelor de protecție socială, pensii și sănătate, cu implicații majore pentru bugetul național și politicile publice. Astfel, în vederea adoptării măsurilor care se impun pentru a atenua consecințelele schimbărilor demografice, este necesară identificarea cauzelor acestora. Totodată, îmbătrânirea populației obligă autoritățile publice să ofere soluții pentru a asigura populației îmbătrânite menținerea calității vieții, pentru un orizont de timp cât mai îndelungat.

În cadrul acestei analizei, am plecat de la considerentul că populația unei țări constituie pilonul formării resurselor de muncă, respectiv punctul de plecare al determinării populației active din care să se extragă populația ocupată. Structura populației reprezintă o sursă prețioasă de informații la nivel macroeconomic, fiind la baza adoptării deciziilor de politică economico-socială.

De multe ori, printre schimbările intervenite în viața unei persoane în vârstă se regăsește dobândirea calității de pensionar. Pentru cei mai mulți oameni, pensionarea înseamnă scăderea veniturilor. De obicei, pensiile constituie principala sursă de venit, dacă nu chiar singura. În condițiile în care speranța de viață crește, populația va trebui să rămână în activitate mai mult timp pentru a avea venituri necesare care să asigure un trai demn. Se înregistrează cazuri în care pensionarii se confruntă chiar cu amenințarea sărăciei la vârste înaintate.

Scopul acestei cercetări constă în analiza fenomenului de îmbătrânire a populației cu care România de confruntă în ultimul timp. În acest sens, am prezentat și am analizat principalele aspecte referitoare la evoluția și structura populației pe vârste, pe medii, pe sexe din România, evidențiate prin serii de date în tabele sau prin reprezentări grafice. Datele utilizate în analiza privind fenomenelor demografice sunt cele publicate de Institutul Național de Statistică și Eurostat.

Cuvinte cheie: durata medie a vieții, rata natalității, rata fertilității, spor natural, îmbătrânirea populației

Clasificarea JEL: J11, Q56, R2.

Introducere

În ultimul timp, tot mai multe țări se confruntă cu fenomenul de îmbătrânire a populației, care reprezintă schimbarea distribuției populației unei țări către vârste mai înaintate. Astfel, se înregistrează o creștere a numărului persoanelor în vârstă, cât și a ponderii acestora în total populație. La nivel mondial, în prezent, se înregistrează peste un miliard de persoane în vârstă și se estimează că vor fi peste va fi de 1,4 miliarde persoane, în anul 2030, respectiv 2,1 miliarde persoane, în anul 2050. În acest context, perioada 2021-2030 este declarată de către Adunarea Generală a Națiunilor Unite *Deceniul ONU al îmbătrânirii sănătoase*, organismul responsabil pentru implementarea acestei acțiuni fiind Organizația Mondială a Sănătății. Obiectivul programului constă în susținerea conceptului de viață lungă și sănătoasă.

O viață mai lungă și sănătoasă poate oferi persoanelor în vârstă oportunități de a-și continua activitatea în muncă sau de a desfășura activități profesionale în alte domenii, de a se bucura de pasiunile pe care le au sau de a descoperi altele noi, de a efectua activități recreative sau de a-și dezvolta creativitatea, aducându-și, în acest mod, contribuția în familia și comunitățile din care fac parte. Însă

toate aceste eventuale activități sunt influențate semnificativ de factorul sănătate, astfel un aspect important de studiat este dacă ani trăiți sunt, de fapt, ani de viață sănătoasă. Pe măsură ce avansează în vârstă, persoanele se confruntă cu nevoi tot mai mari, precum nevoia de asistență medicală și/sau de îngrijire pe termen lung. Uneori, persoanele în vârstă sunt considerate a fi fragile sau dependente, fiind necesare măsuri care să asigure combaterea acestor atitudini nepotrivite față de vârsta înaintată, care pot conduce la discriminare.

Literature review

Anghelache (2023) a efectuat o amplă analiză a evoluției mișcării naturale a populației din România, subliniind impactul declinului demografic asupra ocupării foorței de muncă și asupra creșterii economice. Anghelache și colaboratorii (2021) au realizat un studiu complex privind mișcarea naturală a populației în contextul crizei sanitare, generate de pandemia de virusul Covid-19. Anghelache și Anghel (2018) au cercetat corelația dintre populația ocupată și șomaj, evidențiind că piața muncii din România este caracterizată de un comportament atipic, în care șomajul este în creștere, deși există locuri de muncă vacante. Attanasio, Bonfatti, Kitao și Weber (2016) au efectuat o analiză a literaturii de specialitate referitoare la impactul schimbărilor demografice asupra consumului și securității sociale. Bloom, Canning, Fink și Finlay (2009) au sugert faptul că schimbarea comportamentală, sub forma ofertei crescute de muncă feminină, contribuie semnificativ la creșterea economică în timpul tranziției demografice, când fertilitatea scade. Börsch-Supan, Härtl, Leite și Ludwig (2023) au evaluat efectele reformelor din domeniul pensiilor asupra sustenabilității financiare, bunăstării sociale și egalității intra și intergenerațională într-un cadru unificat, cu mai multe dimensiuni de eterogenitate și diverse reacții comportamentale. Dolls, Doorley și Paulus (2019) au analizat impactul schimbărilor demografice care sunt așteptate la nivelul Uniunii Europene până în anul 2030 asupra distribuției veniturilor. Fernandes, Turra și Rios Neto (2023) au evidențiat fptul că îmbătrânirea populației este un element fundamental al tranziției demografice și că populațiile îmbătrânesc din cauza fluxurilor în scădere (nașteri) la vârsta zero și a ieșirilor insuficiente (decese) la vârste mai înaintate. De asemenea, migrația poate avea un rol relevant în anumite țări sau regiuni. Hejkal, Ravikumar și Vandenbroucke (2025) au propus un model prin care explică tendințele ratelor mortalității și ale speranței de viață la diferite vârste și dinamica populației în Europa de Vest, evidențiind totodată că unele personane, prin faptul că adoptă tehnologii de sănătate mai bune, contribuie la creșterea duratei medii de viață. Hernæs, Markussen, Piggott și Røed (2016) au abordat o serie de aspecte cu privire la sistemul de pensionare anticipată din Norvegia. Iftimoaei (2021) a prezentat elemente semnificative referitoare la evoluția populației din mediul rural din România. Marešová, Mohelská și Kuča (2015) au relizat un studiu cu privire la evoluția și tendințele demografice din Uniunea Europeană, analizând cheltuielile cu serviciile de sănătate pentru seniori și cheltuielile de sănătate estimate, în raport cu tendința demografică din UE. O'Sullivan (2023) a considerat că scăderea fertilității prin intervenții de planificare familială a permis progresul economic și a îmbunătățit accesul femeilor la educație. Riekhoff, Kuitto și Palomäki (2020) au studiat măsura în care a avut loc înlocuirea instrumentelor între căile de ieșire timpurie la pensie în Europa (pensionare anticipată, pensionare în caz de invaliditate). Schmidthuber, Fechter, Schröder și Hess (2021) au studiat modul în care piața muncii și măsurile adoptate în domeniul pensiilor asociate cu îmbătrânirea activă influențează comportamentul de pensionare. Weber și Dabbs Sciubba (2018) au analizat măsura în care creșterea populației cauzează degradarea mediului și au arătat că reducerea emisiilor unei populații în creștere necesită planificare și investiții semnificative.

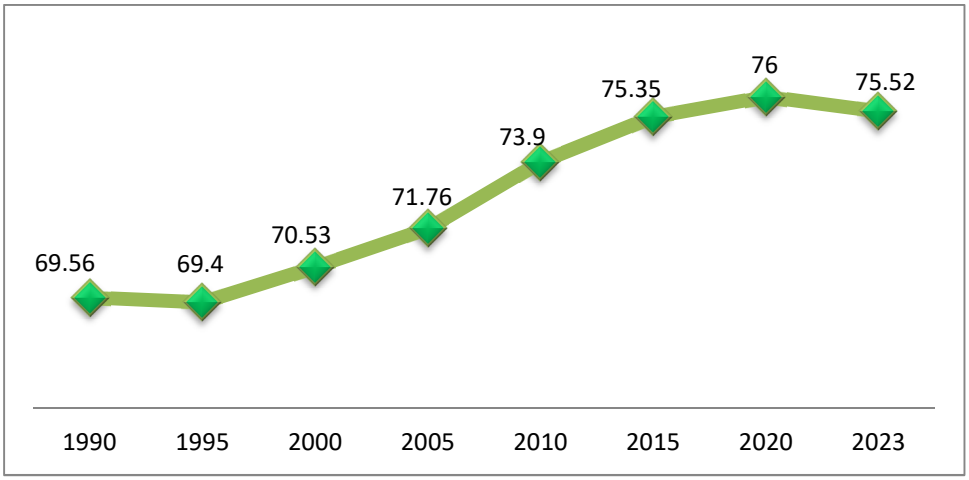
Metodologia cercetării, date, rezultate şi discuţii

Un indicator care trebuie luat în considerare în analizele macroeconomice și în planificarea sistemului de pensii publice și a sistemului de sănătate este longevitatea. Indicatorul esențial pentru evaluarea sănătății populației este speranța de viață la naștere. În cadrul cercetării, primul indicator analizat este durata medie a vieții, care reflectă numărul mediu de ani pe care îi are de trăit un nou născut,

dacă tot restul vieții ar trăi în condițiile mortalității pe vârste din perioada de referință. În figura nr. 1 sunt evidențiate datele referitoare la durata medie a vieții în România, în perioada 1990 – 2023, constatându-se o creștere continuă a indicatorului., cu excepția anului 1995, când s-a înregistrat o ușoară scădere cu 0,16 ani față de anul 1990. Astfel, dacă în anul 1990, durata medie a vieții în România era de 69,56 ani, în anul 2023 a ajuns să fie 75,52 ani, deci cu aproape 6 ani.

Evoluția duratei medii a vieții în România, în perioada 1990 – 2023 (ani)

Figura nr. 1



Sursa: reprezentarea autorului pe baza datelor Institutului Național de Statistică, tempo online, accesat accesat în data de 11 martie 2025.

Creșterea speranței de viață a fost rezultatul ameliorării atât a condițiilor de trai, cât și a celor de muncă, în urma creșterii economice.

Deși s-au înregistrat aceste creșteri în România, trebuie specificat faptul că speranța de viață la naștere în Uniunea Europeană a fost de 81,4 ani în anul 2023, potrivit datelor Eurostat, situând România în partea inferioară a clasamentului european.

În întreaga perioadă supusă analizei, se constată faptul că femeile din România sunt mai longevive, trăind, în medie, cu 7 ani mai mult decât bărbații (a se vedea tabelul nr. 1). Cea mai scăzută durată medie a vieții femeilor s-a înregistrat în anul 1990 (72,65 ani), iar a bărbaților s-a înregistrat în anul 1995 (65,7). În cazul ambelor sexe, maximul a fost atins în anul 2020.

Durata medie a vieții în România pe sexe, în perioada 1990 – 2023 (ani)

Tabelul nr. 1

Anul	Feminin	Masculin	Diferența între sexe*
Coloana 0	Coloana 1	Coloana 2	Coloana 3 = Coloana 1 – Coloana 2
1990	72,65	66,56	+6,09
1995	73,36	65,7	+7,66
2000	74,2	67,03	+7,17
2005	75,47	68,19	+7,28
2010	77,64	70,27	+7,37
2015	78,86	71,88	+6,98
2020	79,67	72,42	+7,25
2023	79,16	71,96	+7,20

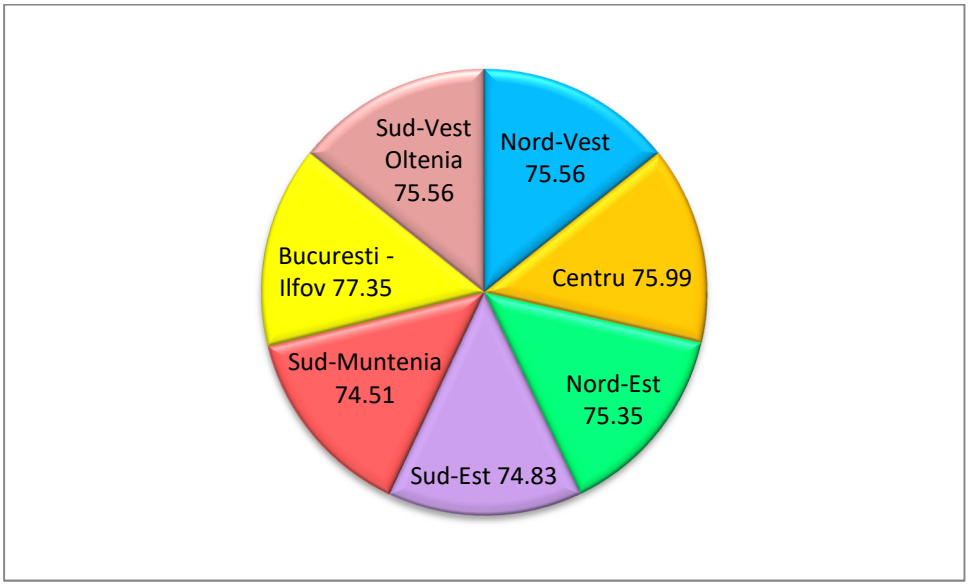
*Sursa: Institutul Național de Statistică, tempo online, accesat în data de 11 martie 2025; *calcule proprii.*

În anul 2023, regiunea cu cea mai mare durată medie a vieții din România este București-Ilfov, aceasta fiind de 77,35 ani. Urmează regiunile Sud-Vest Oltenia și Nord-Vest, ambele cu 75,56 ani. Este de reținut faptul că regiunile Sud-Muntenia, Sud-Est și Nord-Est se situează sub media țării.

Datele pentru toate regiunile României înregistrate în anul 2023 sunt centralizate în figura de mai jos.

Durata medie a vieții în România pe regiuni de dezvoltare în anul 2023 (ani)

Figura nr. 2



Sursa: reprezentarea autorului pe baza datelor Institutului Național de Statistică, tempo online, accesat în data de 11 martie 2025.

Analiza este aprofundată cu studiul duratei medii a vieții pe medii de rezidență, datele fiind centralizate în tabelul următor:

Durata medie a vieții în România pe medii de rezidență, în perioada 1990 – 2023 (ani)

Tabelul nr. 2

Anul	Urban		Rural		Decalaj urban / rural*
	Număr	Modificare față de anul 2000*	Număr	Modificare față de anul 2000*	
1990	:	-	:	-	-
1995	:	-	:	-	-
2000	71,31	-	69,53	-	1,78
2005	72,53	1,22	70,78	1,25	1,75
2010	75,26	3,95	72,2	2,67	3,06
2015	76,58	5,27	73,81	4,28	2,77
2020	77,33	6,02	74,31	4,78	3,02
2023	76,8	5,49	73,88	4,35	2,92

Sursa: Institutul Național de Statistică, tempo online, accesat în data de 11 martie 2025.
*Legenda: ':' - date lipsă; *calculele autorului.*

Atât durata medie de viaţă în mediul urban, cât și cea din mediul rural a crescut în întreg intervalul analizat. Spre exemplu, în anul 2020, comparativ cu anul 2000, durata medie de viaţă a crescut cu 6,02 ani în mediul urban și cu 3,02 ani în mediul rural. De asemenea, se constată faptul că populația din mediul urban trăiește mai mult decât cea din mediul rural, decalajul dintre cele două medii de rezidență fiind prezent în permanență. Cel mai mare decalaj s-a înregistrat în anul 2010, când orășenii au trăit, în medie, cu 3,06 ani mai mult decât populația de la sate, iar cel mai mic decalaj dintre cele două medii a fost înregistrat în anul 2005 (1,75 ani).

În categoria principalilor factori care afectează durata medie a vieții pot fi regăsiți cei de natură socio-economică, precum stilul de viață și nivelul de educație. Astfel, calitatea vieții populației care trăiește în mediul rural este influențată în mod negativ de serviciile publice de slabă calitate în domeniile sănătății și educației, infrasructura deficitară (apă curentă, alimentare cu energie, canalizare, drumuri) sau locurile de muncă slab renumerate.

Creşterea nivelului de trai a condus la schimbări în preferinţele sociale şi ale comportamentului demografic. Spre exemplu, de ceva timp, fenomenul „amânării căsătoriei" a luat o amploare, astfel tinerii amână tot mai mult momentul căsătoriei şi al naşterii copiilor, având alte priorităţi, precum definitivarea pregătirii educaționale, inserția pe piața muncii, avansarea în carierea profesională, dar și modalităţile diversificate de petrecere a timpului liber. De asemenea, unele persoane nu mai vor să aibă copii din cauza veniturilor insuficiente sau a timpului tot mai mare petrecut la locul de muncă.

Tinerii amână momentul naşterii primului copil până când consideră că au un loc de muncă stabil, care le oferă resursele materiale necesare pentru un viață confortabilă. Aceste condiții au condus la creşterea treptată a vârstei medii la care femeile decid să aibă un copil. Astfel, la nivelul țării, vârsta medie a mamei la prima naștere a crescut semnificativ, respectiv cu 5,2 ani în anul 2023 față de anul 1990, ceea ce înseamnă o creștere cu 5,5 ani în mediul urban, adică 29,2 ani este vârsta medie a mamei la prima naștere. În mediul rural, acest indicator a crescut de la 21,3 ani în anul 1990 la 25,5 ani în anul 2023, semnificând o creștere cu 4,2 ani. Datele sunt prezentate în tabelul de mai jos.

Vârsta medie a mamei la prima naștere, pe medii de rezidență, în România, în perioada 1990 – 2023 (ani)

Tabelul nr. 3

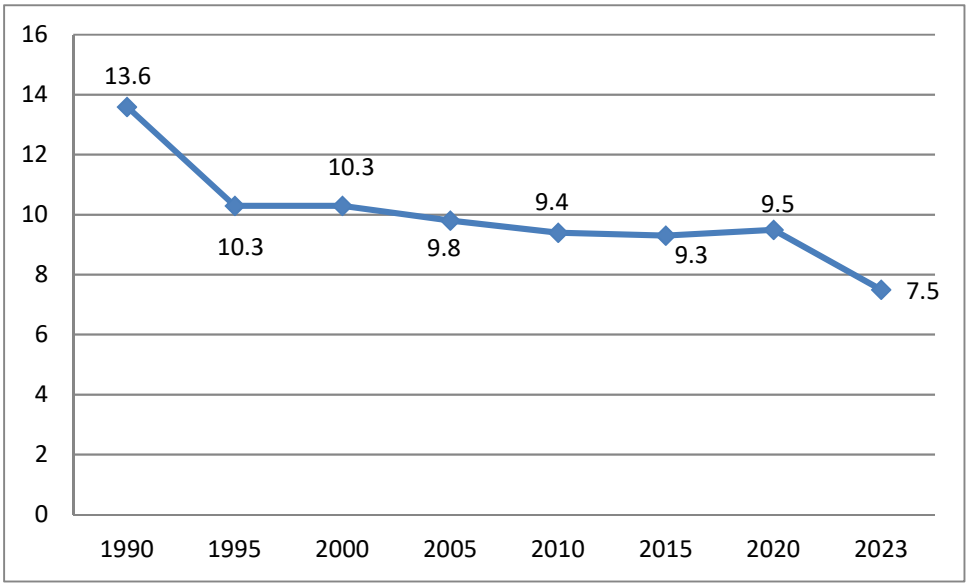
Anul	Total		Urban		Rural	
	Ani	Modificare față de anul 1990*	Ani	Modificare față de anul 1990*	Ani	Modificare față de anul 1990*
1990	22,3	-	23,7	-	21,3	-
1995	22,7	0,4	23,8	0,1	21,6	0,3
2000	23,7	1,4	24,9	1,2	22,3	1
2005	24,9	2,6	26,3	2,6	22,7	1,4
2010	26	3,7	27,5	3,8	23,4	2,1
2015	27	4,7	28,5	4,8	24,6	3,3
2020	27,8	5,5	29,3	5,6	25,6	4,3
2023	27,5	5,2	29,2	5,5	25,5	4,2

*Sursa: Institutul Național de Statistică, tempo online, accesat în data de 15 februarie 2025; *calculele autorului.*

Creşterea vârstei medii a mamei la prima naștere influențează scăderea natalității. Implicit, creșterea vârstei la care femeile au primul copil diminuează șansele de a avea mai mulți copii. Rata de natalitate este indicatorul care evidențiază numărul de născuți-vii dintr-un an raportat la populația de la 1 iulie din statistica curentă. Acesta se exprimă în număr de născuți-vii la 1.000 locuitori. În figura următoare este evidențiată evoluția ratei de natalitate în România, în perioada 1990-2023.

Evoluția ratei de natalitate în România, în perioada 1990-2023 (născuți vii la 1000 locuitori)

Figura nr. 3



Sursa: reprezentarea autorului pe baza datelor Institutului Național de Statistică, tempo online, accesat în data de 06 martie 2025.

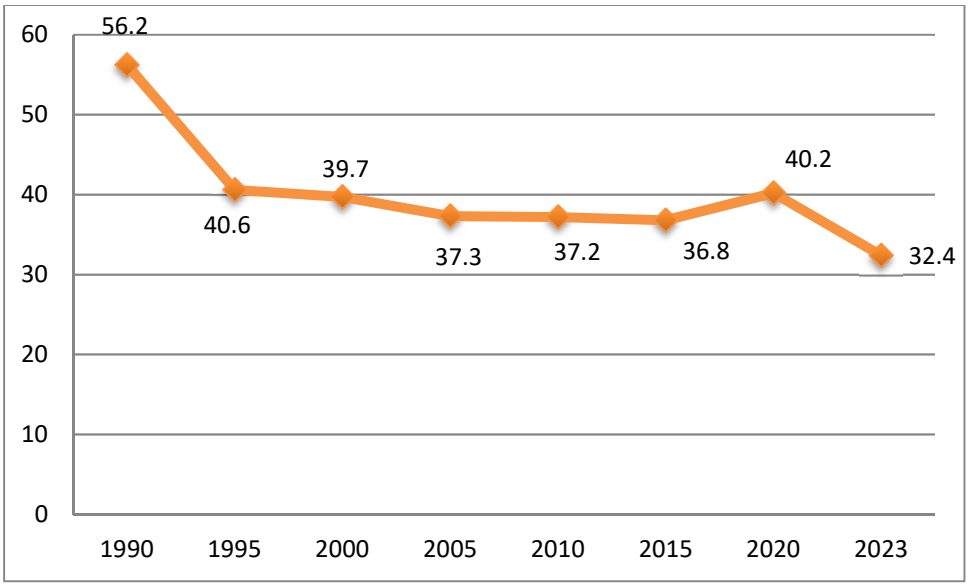
Din analiza datelor de mai sus se constată o scădere dramatică și îngrijorătoare a ratei de natalitate în România, în perioada supusă analizei. Aceasta este cauzată de mix de factori economici, sociali, demografici și culturali, precum schimbarea mentalității sau prioritizarea carierei. În ceva timp, românii preferă familii mai mici pentru a avea un trai mai confortabil. Totodată, modelele sociale s-au schimbat și astfel presiunea de a avea copii la vârste fragede s-a diminuat în timp. De asemenea, tot mai multe femei aleg să își construiască o carieră înainte de a deveni mame, amânând momentul căsătoriei și cel al primei nașteri.

Potrivit datelor Institutului Național de Statistică ce arată mișcarea naturală a populației, în anul 2023, rata generală a fertilității a fost de 32,4‰. Metodologia I.N.S. evidențiază faptul că rata generală de fertilitate reprezină numărul născuților vii dintr-un an raportat la populația feminină de 15 - 49 ani de la 1 iulie din statistica curentă a anului respectiv și se exprimă în numărul de născuți-vii la 1000 femei de vârstă fertilă (15 - 49 ani). Acest indicator se calculează pentru întreg contigentul fertil, cât și pentru grupe cincinale de vârstă.

Scăderea ratei fertilității indică o serie de schimbări economice, sociale și culturale care influențează decizia familiilor de a avea copii. Astfel, un rol important îl au schimbările economice și insecuritatea financiară, printre care costurile ridicate pentru creșterea copiilor (referitoare la asigurarea stării de sănătate, educației și condiții de locuință) sau instabilitatea locurilor de muncă și veniturilor insuficiente.

Evoluția ratei de fertilitate în România, în perioada 1990-2023 (născuți vii la 1000 femei în vârstă fertilă)

Figura nr. 4



Sursa: reprezentarea autorului pe baza datelor Institutului Național de Statistică, tempo online, accesat în data de 06 martie 2025.

De asemenea, nu trebuie omise probleme de fertilitate apărute din cauza stresului, poluării sau stilului de viață nesănătos. Totodată, amânarea momentului în care se dă naștere unui copil determină o perioadă fertilă mai scurtă.

În anul 2023, rata fertilității pentru femeile rezidente în urbanul românesc a fost de 28,6‰, în timp ce pentru femeile rezidente în mediul rural a fost de 37,4‰. Altfel spus, femeile din ruralul românesc sunt mai fertile decât cele din mediul urban, rata fertilității în rural fiind cu 8,8 puncte procentuale mai mare decât în mediul urban. Datele aferente perioadei 1999-2023 sunt prezentate în tabelul de mai jos.

Rata de fertilitate pe medii de rezidență în România, în perioada 1990-2023 (născuți vii la 1000 femei în vârstă fertilă)

Tabelul nr. 4

Anul	Urban	Rural
1990	46,7	69,8
1995	30,7	58,2
2000	29,1	57,8
2005	31,5	47,2
2010	33,8	42,5
2015	34,4	40,2
2020	38	43,2
2023	28,6	37,4

Sursa: Institutul Național de Statistică, tempo online, accesat în data de 27 februarie 2025.

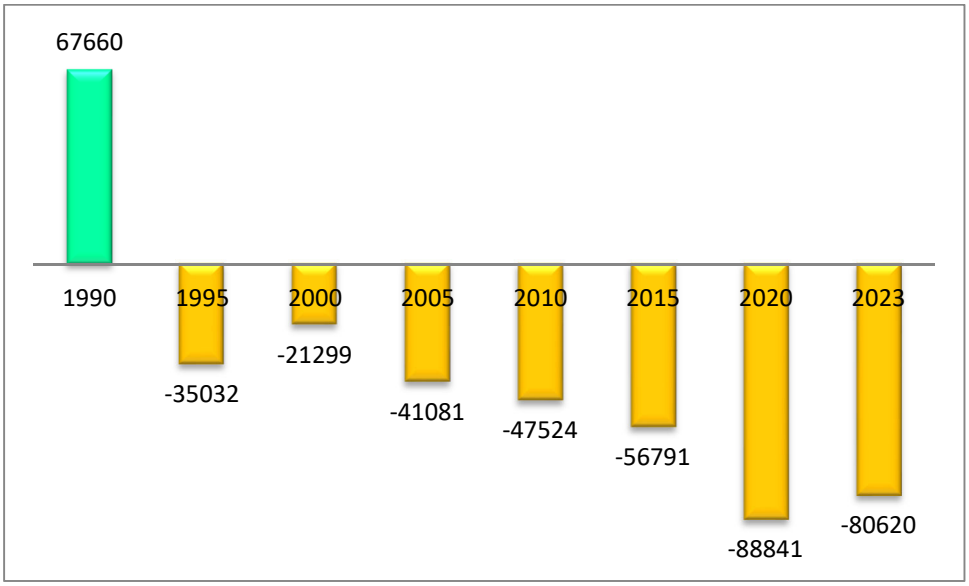
Pe lângă scăderea natalității, concomitent, România se confruntă și cu creșterea mortalității, având drept rezultat un spor natural negativ, proces care determină un declin demografic accelerat și la îmbătrânirea populației.

Potrivit statisticilor oficiale, ponderea populației vârstnice în totalul populației este în continuă creștere, fapt care arată că procesul de îmbătrânire demografică a populației României este puternic și de lungă durată. Sporul natural este diferența dintre numărul născuților-vii și numărul persoanelor decedate, în anul de referință.

Din figura de mai jos se observă faptul că, în perioada 1995-2023, România a înregistrat doar spor natural negativ.

Evoluția sporului natural al populației în România, în perioada 1990-2023 (număr persoane)

Figura nr. 5



Sursa: reprezentarea autorului pe baza datelor Institutului Național de Statistică, tempo online, accesat în data de 06 martie 2025.

Scăderea sporului natural generează presiune pe sistemul de pensii publice și pe sistemul de sănătate, prin prisma faptului că tot mai puțini angajați trebuie să susțină un număr tot mai mare de pensionari. Prin scăderea populației active, țara se confruntă cu deficit de forță de muncă, fiind afectate economia și dezvoltarea țării.

Concluzii

Analiza evoluției mișcării naturale a populației prezintă interes, întrucât acest fenomen influentează evoluția forței de muncă, a populației ocupate, a celei neocupate, precum și ratei șomajului.

Procesul de îmbătrânire demografică generează o serie de efecte de natură socio-economică care influențează creşterea cheltuielilor cu asistenţa medicală şi cu asistenţa socială a persoanelor vârstnice, dar și sustenabilitatea sistemului public de pensii. În general, cele mai afectate sunt persoanele vârstnice singure, care nu primesc sprijin din partea familiei sau a apropiaților și, uneori, nici din partea autorităților locale.

Cele mai vulnerabile și expuse riscului sărăciei și excluziunii sociale sunt persoanele vârstnice și singure. Serviciile de asistență socială nu acoperă toată sfera de nevoi cu care se confruntă acstea și, de obicei, sunt oferite de persoane care nu au instruirea adecvată.

Comparativ cu 1 ianuarie 2023, În anul 2024, procesul de îmbătrânire demografică din România s-a adâncit, constatându-se creșterea ponderii populației vârstnice (de 65 ani şi peste).

În ultimii ani, în România se observă schimbări în comportamentul demografic, determinat de condiţiile de viaţă ale societăţii româneşti. Tinerii sunt preocupați de prelungirea perioadei alocate pregătirii educaționale și manifestă interes pentru angajare și promovare în cariera profesională.

Scăderea natalității și scăderea ratei fertilității sunt două fenomene complexe, cauzate de o combinație de factori economici, sociali și demografici. La nivel macroeconomic, trebuie acordată atenție deosebită evoluției acestori indicatori, întrucât România riscă o accelerare a îmbătrânirii populației și o scădere semnificativă a forței de muncă în viitor și, pe cale de consecință, conducând la un dezechilibre între generațiile active și pensionari, afectând economia și sistemele sociale.

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STUDY ON THE EVOLUTION OF DEMOGRAPHIC PROCESSES IN ROMANIA

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Abstract

The demographic changes in a country affect the evolution of the national economy, having direct effects on social protection, pension and health systems, with major implications for the national budget and public policies. Thus, in order to adopt the necessary measures to mitigate the consequences of demographic changes, it is necessary to identify their causes. At the same time, population aging obliges public authorities to offer solutions to ensure that the aging population maintains its quality of life, for as long as possible.

In this analysis, I started from the consideration that the population of a country constitutes the pillar of the formation of labor resources, respectively the starting point for determining the active population from which to extract the employed population. The population structure represents a precious source of information at the macroeconomic level, being the basis for adopting economic and social policy decisions.

Often, among the changes that occur in the life of an elderly person is the acquisition of the status of pensioner. For most people, retirement means a decrease in income. Pensions are usually the main source of income, if not the only one. Given that life expectancy is increasing, the population will have to remain in work for longer in order to have the necessary income to ensure a dignified life. There are cases where pensioners are even faced with the threat of poverty at an advanced age.

The purpose of this research is to analyze the phenomenon of population aging that Romania has been facing lately. In this regard, I presented and analyzed the main aspects regarding the evolution and structure of the population by age, by environment, by gender in Romania, highlighted through series of data in tables or through graphical representations. The data used in the analysis of demographic phenomena are those published by the National Institute of Statistics and Eurostat.

Keywords: life expectancy, birth rate, fertility rate, natural increase, population aging
JEL Classification: J11, Q56, R2.

Introduction

For some time, more and more countries have been facing the phenomenon of population aging, which represents the change in the distribution of a country's population towards older ages. Thus, there is an increase in the number of elderly people, as well as their share in the total population. Worldwide, there are currently over one billion elderly people and it is estimated that there will be over 1.4 billion people in 2030, respectively 2.1 billion people in 2050. In this context, the period 2021-2030 is declared by the United Nations General Assembly as the UN Decade of Healthy Ageing, the body responsible for implementing this action being the World Health Organization. The objective of the program is to support the concept of a long and healthy life.

A longer and healthier life can offer older people opportunities to continue working or pursuing other careers, to enjoy their passions or discover new ones, to engage in recreational activities or to develop their creativity, thus contributing to their families and communities. However, all of these potential activities are significantly influenced by health, so an important aspect to study is whether the

years lived are, in fact, years of healthy life. As people age, they face increasing needs, such as the need for medical assistance and/or long-term care. Sometimes, older people are considered to be frail or dependent, and measures are needed to combat these inappropriate attitudes towards old age, which can lead to discrimination.

Literature review

Anghelache (2023) conducted a comprehensive analysis of the evolution of the natural population movement in Romania, highlighting the impact of demographic decline on employment and economic growth. Anghelache et al. (2021) conducted a comprehensive study on the natural population movement in the context of the health crisis caused by the Covid-19 pandemic. Anghelache and Anghel (2018) investigated the correlation between the employed population and unemployment, highlighting that the Romanian labor market is characterized by an atypical behavior, in which unemployment is increasing, although there are job vacancies. Attanasio, Bonfatti, Kitao and Weber (2016) conducted a literature review on the impact of demographic changes on consumption and social security. Bloom, Canning, Fink and Finlay (2009) suggested that behavioural change, in the form of increased female labour supply, contributes significantly to economic growth during the demographic transition, when fertility declines. Börsch-Supan, Härtl, Leite and Ludwig (2023) assessed the effects of pension reforms on financial sustainability, social well-being and intra- and intergenerational equality in a unified framework with multiple dimensions of heterogeneity and diverse behavioural responses. Dolls, Doorley and Paulus (2019) analysed the impact of demographic changes expected at the European Union level by 2030 on income distribution. Fernandes, Turra and Rios Neto (2023) highlighted the fact that population ageing is a fundamental element of the demographic transition and that populations age due to decreasing inflows (births) at age zero and insufficient outflows (deaths) at older ages. Migration may also play a relevant role in certain countries or regions. Hejkal, Ravikumar and Vandenbroucke (2025) proposed a model to explain trends in mortality rates and life expectancy at different ages and population dynamics in Western Europe, highlighting that some individuals, by adopting better health technologies, contribute to increasing average life expectancy. Hernæs, Markussen, Piggott and Røed (2016) addressed a number of aspects regarding the early retirement system in Norway. Iftimoaei (2021) presented significant elements regarding the evolution of the rural population in Romania. Marešová, Mohelská and Kuča (2015) conducted a study on demographic developments and trends in the European Union, analysing health care expenditure for seniors and estimated health expenditure in relation to the EU demographic trend. O'Sullivan (2023) considered that the decline in fertility through family planning interventions enabled economic progress and improved women's access to education. Riekhoff, Kuitto and Palomäki (2020) studied the extent to which instrument substitution has occurred between early retirement pathways in Europe (early retirement, disability retirement). Schmidthuber, Fechter, Schröder and Hess (2021) studied how labour market and pension measures associated with active ageing influence retirement behaviour. Weber and Dabbs Sciubba (2018) analyzed the extent to which population growth causes environmental degradation and showed that reducing the emissions of a growing population requires significant planning and investment.

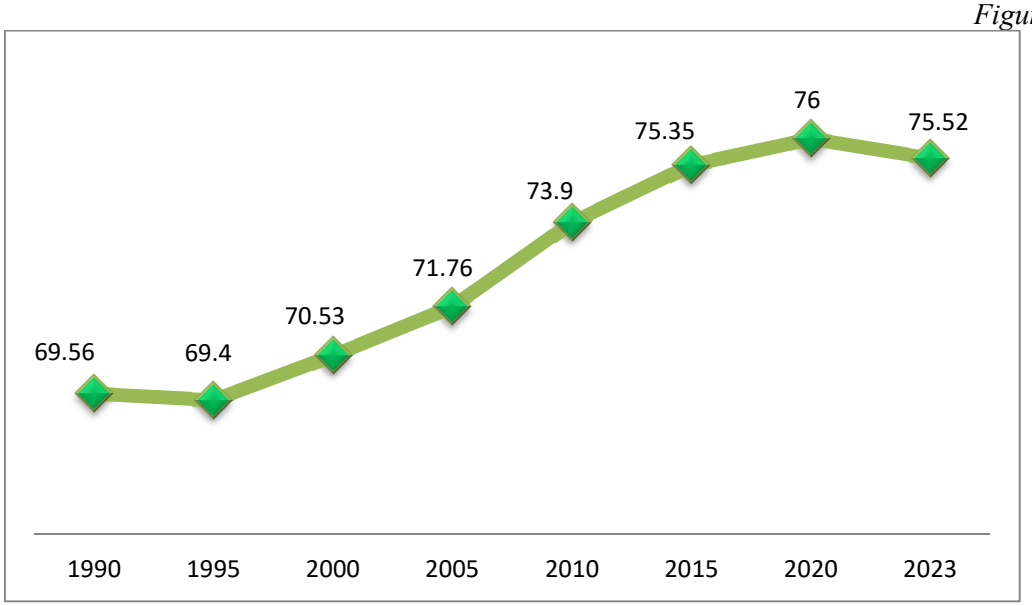
Research methodology, data, results and discussions

An indicator that must be taken into account in macroeconomic analyses and in planning the public pension system and the health system is longevity. The essential indicator for assessing the health of the population is life expectancy at birth. In the research, the first indicator analyzed is the average life expectancy, which reflects the average number of years a newborn would have to live, if the rest of his life were to live under the age-specific mortality conditions of the reference period. Figure no. 1 highlights the data on the average life expectancy in Romania, during the period 1990 – 2023, noting a continuous increase in the indicator, except for 1995, when a slight decrease of 0.16 years was recorded

compared to 1990. Thus, if in 1990, the average life expectancy in Romania was 69.56 years, in 2023 it reached 75.52 years, i.e. by almost 6 years.

Evolution of average life expectancy in Romania, between 1990 and 2023 (years)

Figure no. 1



Source: author's representation based on data from the National Institute of Statistics, tempo online, accessed accessed on March 11, 2025.

The increase in life expectancy was the result of the improvement of both living and working conditions, following economic growth.

Although these increases were recorded in Romania, it should be noted that life expectancy at birth in the European Union was 81.4 years in 2023, according to Eurostat data, placing Romania at the bottom of the European ranking.

Throughout the period under analysis, it is found that women in Romania are longer-lived, living, on average, 7 years longer than men (see table no. 1).

The lowest average life expectancy for women was recorded in 1990 (72.65 years), and for men in 1995 (65.7). For both sexes, the maximum was reached in 2020.

Average life expectancy in Romania by sex, during the period 1990 – 2023 (years)

Table no. 1

Year	Female	Male	Difference between the sexes*
Column 0	Column 1	Column 2	Column 3 = Column 1 – Column 2
1990	72.65	66.56	+6.09
1995	73.36	65.7	+7.66
2000	74.20	67.03	+7.17
2005	75.47	68.19	+7.28
2010	77.64	70.27	+7.37
2015	78.86	71.88	+6.98
2020	79.67	72.42	+7.25
2023	79.16	71.96	+7.20

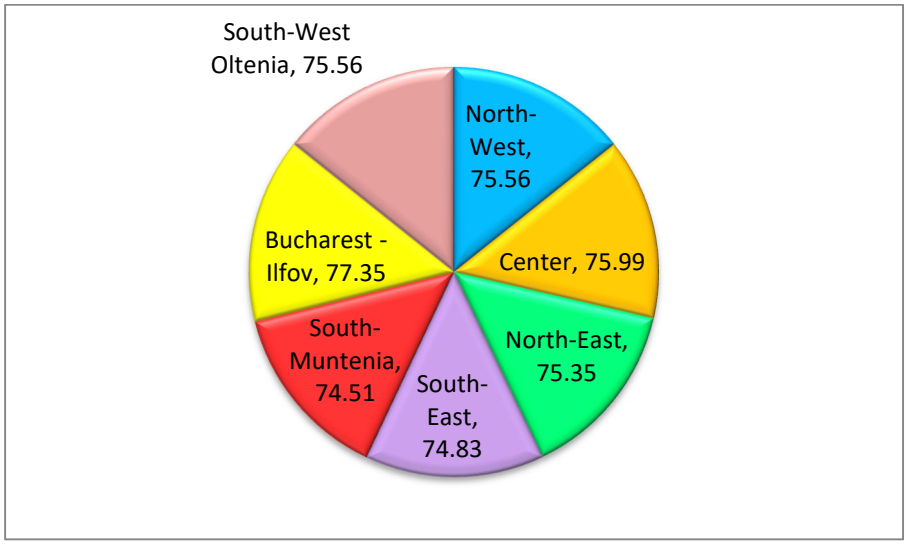
*Source: National Institute of Statistics, online tempo, accessed on March 11, 2025; *own calculations.*

In 2023, the region with the highest average life expectancy in Romania is Bucharest-Ilfov, at 77.35 years. It is followed by the South-West Oltenia and North-West regions, both at 75.56 years. It is worth noting that the South-Muntenia, South-East and North-East regions are below the national average.

The data for all regions of Romania recorded in 2023 are summarized in the figure below.

Average life expectancy in Romania by development regions in 2023 (years)

Figure no. 2



Source: author's representation based on data from the National Institute of Statistics, online tempo, accessed on March 11, 2025.

The analysis is deepened with the study of the average life expectancy by residence area, the data being centralized in the following table:

Table no. 2. Average life expectancy in Romania by residence area, during the period 1990 – 2023 (years)

Year	Urban		Rural		Urban/rural gap*
	Number	Change compared to 2000*	Number	Change compared to 2000*	
1990	:	-	:	-	-
1995	:	-	:	-	-
2000	71.31	-	69.53	-	1.78
2005	72.53	1.22	70.78	1.25	1.75
2010	75.26	3.95	72.2	2.67	3.06
2015	76.58	5.27	73.81	4.28	2.77
2020	77.33	6.02	74.31	4.78	3.02
2023	76.8	5.49	73.88	4.35	2.92

Source: National Institute of Statistics, online tempo, accessed on March 11, 2025.
*Legend: ':' - missing data; *author's calculations.*

Both urban and rural life expectancy increased throughout the period analyzed. For example, in 2020, compared to 2000, the average life expectancy increased by 6.02 years in urban areas and by 3.02 years in rural areas. It is also noted that the urban population lives longer than the rural population, the gap between the two areas of residence being permanently present. The largest gap was recorded in 2010, when city dwellers lived, on average, 3.06 years longer than the rural population, and the smallest gap between the two areas was recorded in 2005 (1.75 years).

The main factors affecting the average life expectancy include those of a socio-economic nature, such as lifestyle and level of education. Thus, the quality of life of the population living in rural areas is negatively influenced by poor public services in the areas of health and education, poor infrastructure (running water, energy supply, sewage, roads) or low-paid jobs.

The increase in the standard of living has led to changes in social preferences and demographic behavior. For example, for some time now, the phenomenon of "postponing marriage" has been gaining momentum, so young people are increasingly postponing the moment of marriage and the birth of children, having other priorities, such as completing their educational training, entering the labor market, advancing in their professional careers, but also diversifying ways of spending their free time. Also, some people no longer want to have children due to insufficient income or the increasing time spent at work.

Young people are postponing the moment of the birth of their first child until they consider that they have a stable job, which provides them with the necessary material resources for a comfortable life. These conditions have led to a gradual increase in the average age at which women decide to have a child. Thus, at the country level, the average age of the mother at first birth has increased significantly, namely by 5.2 years in 2023 compared to 1990, which means an increase of 5.5 years in the urban area, i.e. 29.2 years is the average age of the mother at first birth. In rural areas, this indicator has increased from 21.3 years in 1990 to 25.5 years in 2023, meaning an increase of 4.2 years. The data are presented in the table below.

Average age of the mother at first birth, by area of residence, in Romania, during the period 1990 – 2023 (years)

Table no. 3

Year	Total		Urban		Rural	
	Indicator	Change compared to 1990*	Indicator	Change compared to 1990*	Indicator	Change compared to 1990*
1990	22.3	-	23.7	-	21.3	-
1995	22.7	0.4	23.8	0.1	21.6	0.3
2000	23.7	1.4	24.9	1.2	22.3	1
2005	24.9	2.6	26.3	2.6	22.7	1.4
2010	26	3.7	27.5	3.8	23.4	2.1
2015	27	4.7	28.5	4.8	24.6	3.3
2020	27.8	5.5	29.3	5.6	25.6	4.3
2023	27.5	5.2	29.2	5.5	25.5	4.2

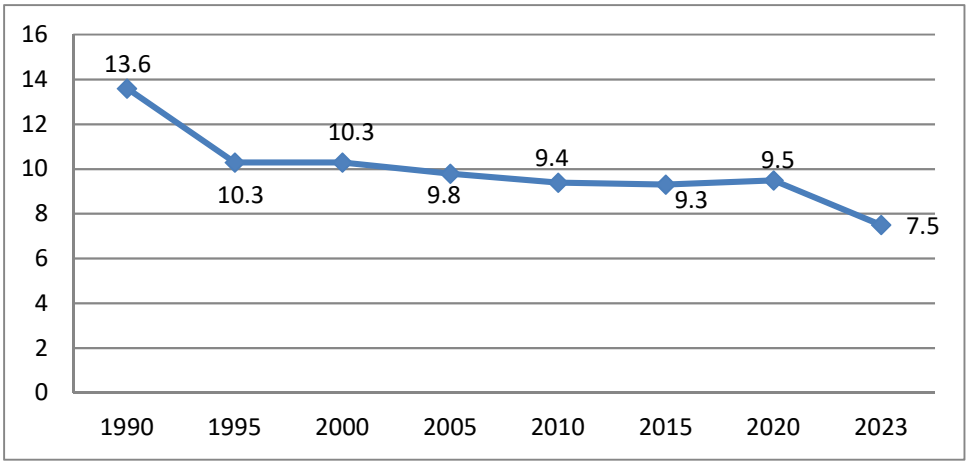
*Source: National Institute of Statistics, online tempo, accessed on February 15, 2025; *author's calculations.*

The increase in the average age of the mother at first birth influences the decrease in the birth rate. By implication, the increase in the age at which women have their first child decreases the chances of having more children. The birth rate is the indicator that highlights the number of live births in a year

compared to the population as of July 1 from the current statistics. It is expressed in the number of live births per 1,000 inhabitants. The following figure highlights the evolution of the birth rate in Romania, during the period 1990-2023.

Evolution of the birth rate in Romania, during the period 1990-2023 (live births per 1000 inhabitants)

Figure no. 3



Source: author's representation based on data from the National Institute of Statistics, online tempo, accessed on March 6, 2025.

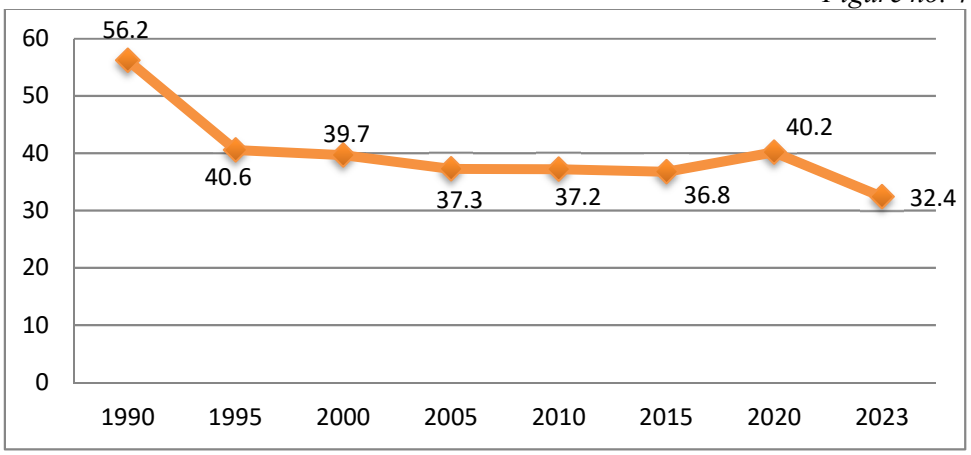
From the analysis of the above data, a dramatic and worrying decrease in the birth rate in Romania is observed, during the period under analysis. This is caused by a mix of economic, social, demographic and cultural factors, such as changing mentality or prioritizing career. For some time, Romanians prefer smaller families in order to have a more comfortable life. At the same time, social models have changed and thus the pressure to have children at a young age has diminished over time. Also, more and more women are choosing to build a career before becoming mothers, postponing the moment of marriage and that of the first birth.

According to data from the National Institute of Statistics showing the natural movement of the population, in 2023, the general fertility rate was 32.4‰. The I.N.S. methodology highlights that the general fertility rate represents the number of live births in a year compared to the female population aged 15 - 49 as of July 1 of the current statistics of the respective year and is expressed in the number of live births per 1000 women of childbearing age (15 - 49 years). This indicator is calculated for the entire fertile population, as well as for five-year age groups.

The decrease in the fertility rate indicates a series of economic, social and cultural changes that influence the decision of families to have children. Thus, an important role is played by economic changes and financial insecurity, including the high costs of raising children (related to ensuring health, education and housing conditions) or the instability of jobs and insufficient income.

Evolution of the fertility rate in Romania, during the period 1990-2023 (live births per 1000 women of childbearing age)

Figure no. 4



Source: author's representation based on data from the National Institute of Statistics, online tempo, accessed on March 6, 2025.

Also, fertility problems caused by stress, pollution or an unhealthy lifestyle should not be overlooked. At the same time, postponing the moment of giving birth to a child determines a shorter fertile period.

In 2023, the fertility rate for women residing in urban Romania was 28.6‰, while for women residing in rural areas it was 37.4‰. In other words, women in rural Romania are more fertile than those in urban areas, the fertility rate in rural areas being 8.8 percentage points higher than in urban areas. The data for the period 1999-2023 are presented in the table below.

Fertility rate by area of residence in Romania, during the period 1990-2023 (live births per 1000 women of childbearing age)

Table no. 4

Year	Urban	Rural
1990	46.7	69.8
1995	30.7	58.2
2000	29.1	57.8
2005	31.5	47.2
2010	33.8	42.5
2015	34.4	40.2
2020	38	43.2
2023	28.6	37.4

Source: National Institute of Statistics, online tempo, accessed on February 27, 2025.

In addition to the decrease in birth rate, Romania is also facing an increase in mortality, resulting in a negative natural increase, a process that determines an accelerated demographic decline and population aging.

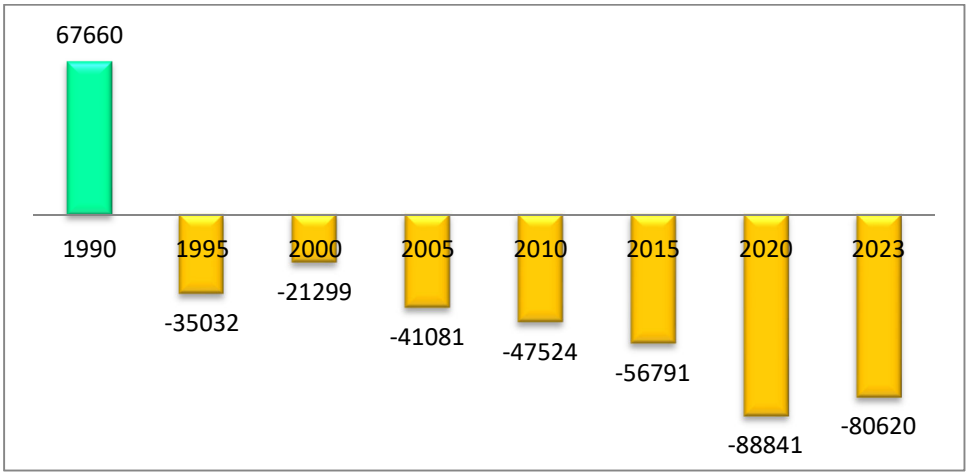
According to official statistics, the share of the elderly population in the total population is continuously increasing, which shows that the demographic aging process of the Romanian population

is strong and long-lasting. Natural increase is the difference between the number of live births and the number of deaths in the reference year.

From the figure below, it can be seen that, in the period 1995-2023, Romania recorded only negative natural increase.

Evolution of the natural population growth in Romania, during the period 1990-2023 (number of people)

Figure no. 5



Source: author's representation based on data from the National Institute of Statistics, online tempo, accessed on March 6, 2025.

The decline in natural growth is putting pressure on the public pension system and the healthcare system, as fewer employees have to support a growing number of retirees. With the decline in the active population, the country is facing a labor shortage, affecting the economy and development of the country..

Conclusions

The analysis of the evolution of the natural population movement is of interest, since this phenomenon influences the evolution of the labor force, the employed and unemployed population, as well as the unemployment rate.

The demographic aging process generates a series of socio-economic effects that influence the increase in healthcare and social assistance expenses for the elderly, as well as the sustainability of the public pension system. In general, the most affected are single elderly people, who do not receive support from their family or loved ones and, sometimes, not even from local authorities.

The most vulnerable and exposed to the risk of poverty and social exclusion are the elderly and single people. Social assistance services do not cover the entire range of needs they face and are usually provided by people who do not have the appropriate training.

Compared to January 1, 2023, In 2024, the demographic aging process in Romania has deepened, with an increase in the share of the elderly population (65 years and over).

In recent years, changes in demographic behavior have been observed in Romania, determined by the living conditions of Romanian society. Young people are concerned about extending the period allocated to educational training and are interested in employment and promotion in their professional careers.

The decline in the birth rate and the decline in the fertility rate are two complex phenomena, caused by a combination of economic, social and demographic factors. At the macroeconomic level, special attention must be paid to the evolution of these indicators, as Romania risks an acceleration of

population aging and a significant decrease in the labor force in the future and, consequently, leading to an imbalance between the active and retired generations, affecting the economy and social systems.

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Identificarea elementelor necesare pentru stabilirea unor modele statistico-econometrice aplicabile pentru reteritorializarea terenurilor și strategiilor agricole

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Abstract

În contextul creșterii necesarului de energie și a politicilor europene de adoptare a strategiilor de dezvoltare durabilă și a strategiilor de decarbonificare a producției de energie se dislocă suprafețe însemnate din circuitul agricol, suprafețe ce se transferă, în acest fel, exclusiv investițiilor generatoare de energie provenită din surse regenerabile, mai concret parcurilor fotovoltaice generatoare de energie produsă cu ajutorul soarelui și parcurilor eoliene, generatoare de energie provenită din viteza vântului. Reteritorializarea reprezintă o soluție viabilă pentru a reduce din deficitul produs fondului agricol prin dislocarea suprafețelor de teren din circuitul agricol și de a participa și susține în continuare dezvoltarea durabilă și conceptul de sustenabilitate.

Contextul global are, pe lângă elementele de sustenabilitate și mediu, susținute de conceptul dezvoltării durabile, și elemente de siguranță energetică a statelor. România și celelalte state europene sunt implicate asumat în procesul de dezvoltare al acestei ramuri a industriei energetice cu ținte clare de progres. În egală măsură se urmărește și reducerea dependenței de soluțile energetice provenite din Rusia, adică gazul importat atât de Romania, cât și de Europa, precum și dependența acestei industrii față de lanțul de aprovizionare din China, furnizarea elementelor de infrastructură făcându-se aproape exclusiv de la producători din China.

În acest articol, autorul și-a propus să identifice elementele ce sunt necesare pentru a stabili unele modele statistico-econometrice care sunt optime și aplicabile pentru conceptul de reteritorializare a terenurilor. Conceptul de reteritorializare a apărut în contextul dezvoltării dinamice a domeniul energiei regenerabile, respectiv a parcurilor fotovoltatice, însă nu numai fiind aplicabil și în cazul parcurilor energetice eoliene. Marii dezvoltatori și investitori ai acestor stabilimente producătoare de energie au dislocat din circuitele agricole suprafețe însemnate pentru dezvoltarea acestor investiții. Nevoile energetice naționale sunt prioritare în economie datorită strategiilor de dezvoltare durabilă fiind parte chiar a strategiilor europene. Agricultura este parte a nevoilor esențiale ale omenirii, ceea ce o face în egală măsură o ramură economică strategică.

Pentru a sublinia importanța ce trebuie acordată acestui subiect și pentru a argumenta acest lucru, în cadrul articolului sunt prezentate unele date statistice relevante pentru a identifica evoluțiile. Agricultura se confruntă în ultimii ani cu dificultăți generate de schimbările climatice cum sunt seceta, inundațiile, variațiile abrupte de temperatură și, nu în ultimul rând, fenomenele extreme, care au devenit tot mai frecvente, acestea făcând parte din categoria celor impredictibile, generând pierderi importante pentru fermieri odată cu momentul manifestării lor. Totodată, putem afirma ca în România, suprafața irigată a scăzut dramatic.

Cuvinte cheie: sustenabilitate, model agrofotovoltaic, energie verde, dezvoltare durabilă, model econometric.

Clasificarea JEL: C10, O13, Q56

Introducere

Conceptul reteritorializării în baza conceptului agrofotovoltaic are ca principiu utilizarea spațiului neutilizat din jurul panourilor fotovoltaice pentru culturi agricole sau alte destinații complementare, ceea ce duce la o reutilizare parțială a terenurilor. Această abordare combină în mod simbiotic producția de energie verde cu activitățile agricole, creând o sinergie între producția de energie regenerabilă și agricultură, contribuind la o economie mai verde și mai rezilientă, contribuind la utilizarea eficientă a terenurilor. Prin implementarea diverselor culturi între panourile fotovoltaice, terenurile care au fost scoase din circuitul agricol pentru producția de energie, pot fi parțial revitalizate.

Modelul agrofotovoltaic integrează panourile fotovoltaice cu activitățile agricole pe același teren, optimizând ambele utilizări. Pentru a implementa eficient un astfel de sistem, este esențial să fie considerate atât aspectele tehnice ale instalării panourilor fotovoltaice, cât și spațiul disponibil pentru culturi și condițiile de climă și sol.

La nivel de dezvoltare ulterioară, ar fi necesar să fie luate în considerare încă din faza de proiect elementele necesare pentru folosirea terenurilor în mod eficient și sustenabil conform strategiilor de dezvoltare durabilă. Și în cazul parcurilor eoliene, conceptul privind reteritorializarea ar trebui implementat ca element obligatoriu încă din stadiul de proiect, date fiind distanțele mari necesare între turbinele eoliene. Spațiile disponibile rămase pentru reteritorializare sunt proporțional mult mai însemnate decât spațiul tehnologic necesar turbinelor eoliene. Nu trebuie să pierdem din vedere spațiul disponibil enorm pe care se bazează dezvoltarea de parcuri eoliene, aceste terenuri fiind extrase tot din circuitul agricol, determinând scăderea suprafețelor de teren cultivate, pe cale de consecință a infrastructurii generatoare de hrană pentru populația care este în continuă creștere.

Literature review

Angelsen (2010) a prezentat o serie de elemente care sunt avute în vedere în ceea ce înseamnă producția agricolă, iar Anghel, Anghelache și Panait (2017) au analizat rezultatele obținute în agricultură în Uniunea Europeană, atât per ansamblu, cât și pentru fiecare stat membru. Anghelache, Samson și Stoica (2020) au analizat principalele elemente ale strategiei Uniunii Europene în ceea ce privește ramura agricolă. Anghelache și Dumitrescu (2015) au analizat indicii de producție în agricultură. Anghelache, Strijek și Dumitru (2024) au analizat dinamica producției vegetale în România a principalelor culturi în anul 2023. Bezemer și Headey (2008) au abordat aspecte privind măsurile care pot fi implementate pentru dezvoltarea agriculturii. Quamrul și Michalopoulos (2015) au cercetat implicațiile fluctuațiilor climatice asupra agriculturii. Swintona, Lupi, Robertson, Hamilton (2007) au analizat rolul ecosistemelor agricole pentru beneficii diverse. Strijek D (2024), a prezentat importanța energiei în producţia industrială.

Astfel, Anghelache C. și Anghel M.G. (2024) abordează o problemă sensibilă ce privește dependența Uniunii Europene de furnizorii unici, care reprezintă un aspect de îngrijorare și constituie o componentă fundamentală a securității energetice. Best R. (2017) studiază importanța capitalului financiar și influența acestuia în dezvoltare având în vedere consumul diferitelor tipuri de energie: biocombustibili și deșeuri, hidro, cărbune, ulei, gaz natural, nuclear, eoliană, solară și geotermală. Cheikh N.B., Zaied Y.B. (2024) sunt preocupați de interdependența dinamică dintre sursele de energie regenerabile și principalii săi factori, punând accent pe rolul evenimentelor geopolitice. Correlj A., Hoppe T., Künneke R. (2024) au o perspectivă analitică multidisciplinară, care abordează guvernanța, aspectele instituționale și etice, referitoare la implicarea cetățenilor în sistemele energetice durabile urbane, pornind de la realitatea că orașele sunt implicate direct în emisia a aproximativ 75% din totalul global al emisiilor de CO2. Sectoarele transporturilor și construcțiilor fiind cei mai mari contributori în acest sens. Deleidi M., Mazzucato M., Semieniuk G. (2020) au pus sub lupă efectul investițiilor publice directe asupra investițiilor private cu privire la tehnologiile de producere a energiei regenerabile. Husain S., Sohag K., Wu Y. (2024) sunt preocupați de eficacitatea politicilor de mediu în promovarea producției de energie regenerabilă, făcând în acest sens un studiu utilizând metoda de estimare CS-ARDL, care

este o versiune mai avansată a metodei de estimare a mediei grupurilor. Iacob și Strijek (2024) explorează și ei în lucrare importanța dezvoltării durabile și elementele cheie, iar Strijek (2024) face cunoscută importanța reteritorializării ca parte a dezvoltării durabile și a recuperării terenurilor agricole în contextul simbiozei a două domenii strategice. Metodologia înfășurării datelor (DEA) a fost dezvoltată și prezentată de către Charnes, Cooper și Rhodes (1978) urmând ca ulterior să fie aprofundată de Banker, Charnes și Cooper (1984).

Metodologia cercetării, date, rezultate şi discuţii

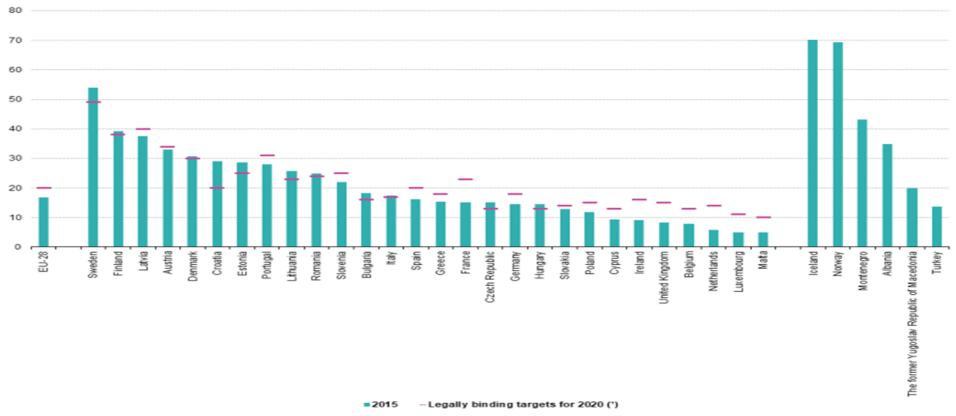
Având în vedere toate elementele de mai sus se naște întrebarea cum este nevoie sa abordăm problema pentru a găsi o soluție potrivită. Astfel, se dezvoltă ideea pentru identificarea unor modele statistico-econometrice aplicabile pentru reteritorializarea terenurilor și strategiilor agricole agroalimentare. Aceasta este parte a unui studiu mai amplu deoarece conține extrem de multe variabile care influențează rezultatele aplicabile.

Putem afirma și că strategiile de dezvoltare uneori sunt focusate pe cate un domeniu, ori industrie fără a lua în calcul efectele acesteia în raport cu celelalte, ori omiterea unora dintre industrii. Pentru exemplificare, putem lua in considerare industria energetică și nevoia ridicată de dezvoltare a acesteia pentru a satisface consumul tot mai mare necesar societății actuale. Începând cu industriile producătoare și prelucrătoare de bunuri, servicii prestate populației, pâna la nevoia crescută pentru încărcare a automobilelor electrice.

Țările europene și-au propus, în cadrul strategiilor de dezvoltare durabilă, obiective și ținte de producere a energiei din surse regenerabile, acestea fiind atribuie în principal surselor de producție eoliană, dar în special solară. În mod cert producția din aceste surse va crește, garanția fiind angajamentele statelor europene asumate care sunt prezentate mai jos în figura nr.1:

Producția de energie verde și obiectivele asumate

Figura nr. 1

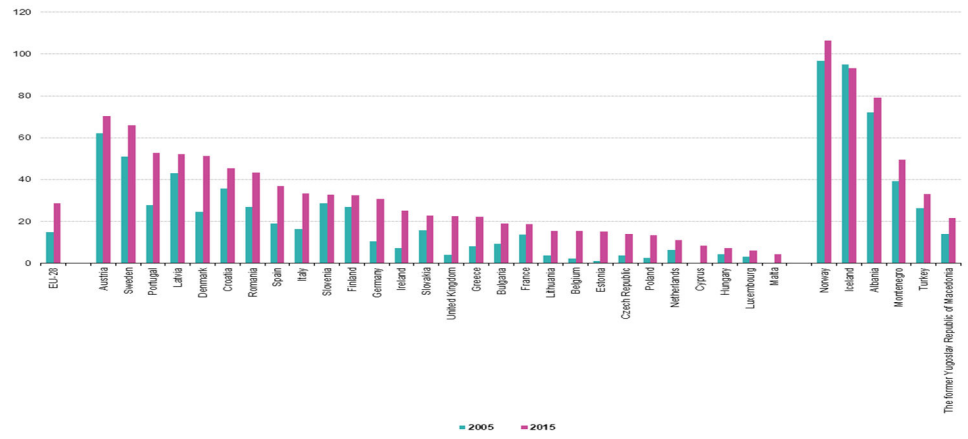


Sursa: Eurostat

Angajamentele climatice ale Europei și preocuparea pentru energii din surse regenerabile, sustenabile sunt susținute în timp, Europa fiind un jucator important în pactul climatic. În acest context, Romania se situează printre primele locuri fiind printre țările care și-au depășit obiectivele asumate la producția de energie regenerabilă, peste media europeană. Pentru susținerea acestui argument, figura. nr. 2, prezentată de mai jos, prezintă ponderea energiei electrice generate din surse regenerabile în anul 2005 şi în anul 2015, fiind evidentă o creștere importantă a acesteia.

Ponderea energiei electrice generate din surse regenerabile, anul 2005 şi anul 2015

Figura nr. 2



Sursa: Eurostat

Urmare a perioadei pandemice Covid-19, economia Europei a fost puternic afectată. Comisia Europeană, conform Pactului Ecologic European adoptat, şi-a asumat într-o manieră ecologică redresarea economică, însă chiar dacă voința politică există, investițiile care sunt necesare pentru redresarea după episodul de pandemie şI, implicit, cheltuielile necesare atenuării consecințelor războiului în curs, au ca efect încetinirea implementării politicilor şi angajamentelor ecologice, iar redresarea se face cu sacrificarea unor considerente ecologice. Noile decizii la nivel european certifică faptul că țintele de decarbonificare au fost prea idealiste şi în fapt au afectat industriile, au adăugat costuri producției şi au făcut ca jucători importanți din domenii cheie de dezvoltare sa devină necompetitivi şi să îşi piardă avantajele economice. Mai mult, unii dintre ei au fost nevoiți să îşi restrângă activitatea. Această decizie de a reanaliza țintele, direcția şi viteza de dezvoltare provine şi de la noile direcții pe care le dau Statele Unite ale Americii odată cu realegerea președintelui Trump.

Decizia SUA de a readera la Acordul de la Paris, odată cu președinția deținuta de Joe Biden şi organizarea unui summit internațional privind clima, a adus o speranță, arătând lumii o schimbare semnificativă față de politica președintelui Trump din primul mandat, indicând la acel moment că SUA se înscrie pe traiectoria angajamentelor favorabile politicilor de mediu. Cu toate acestea, implementarea măsurilor climatice pe termen lung în SUA rămânea o provocare, având în vedere dimensiunea divergențelor politice existente în acel moment şi opoziția puternică din partea forțelor influente, China şi alte economii din Asia reprezentând cea mai mare parte a creşterii globale a sectorului cărbunelui. Angajamentele mai multor țări asiatice pentru neutralitatea climatică sugerează însă o mişcare în favoarea reducerii sporite a emisiilor, dar chiar şi cei mai mari actori au stabilit termene lungi, anul 2060 pentru China şi anul 2070 pentru India. Ritmul schimbărilor rămânea incert având în vedere termenele mari şi instabilitatea factorilor de decizie. Având însă în vedere realegerea în funcția de președinte SUA a lui Donald Trump şi decizia imediată a acestuia de a scoate din nou SUA din pactul climatic, imediat după preluarea mandatului, previziunile pentru o energie verde sunt cu adevărat incerte. Necesarul pentru investiții în vederea producerii de energie preponderent din surse regenerabile este mare, iar un jucător important in industrie aşa cum este SUA poate înclina balanța în partea opusă sustenabilității.

Observăm că de cele mai multe ori interesele economice imediate sau decidenții politici schimba în mod eronat parcursul optim de dezvoltare, fapt petrecut şi în cazul de față, unde nevoia de energie

crescută a viciat parcursul strategiei de dezvoltare durabilă pentru decarbonificare și a extras din circuitul agricol suprafețe însemnate pentru dezvoltarea facilităților de producție de energie regenerabilă.

Așa cum am arătat în figurile de mai sus, România a înregistrat o dezvoltare importantă în sectorul energiei regenerabile, făcând ca pentru realizarea acestui lucru, pe lângă investițiile necesare să fie scoase din circuitul agricol suprafețe importante de terenuri unde să fie realizate aceste investiții, care altfel ar fi folosit producției agricole. Chiar dacă în unele sectoare agricole, tehnicile moderne și utilajele performate au dus la o creștere a rentabilității, aceasta nu poate compensa lipsa terenurilor în exploatare. Această direcție de dezvoltare a fost elementul declanșator al conceptului de reteritorializare.

În ultima perioadă, conceptul de reteritorializare s-a dezvoltat destul de mult putând chiar afirma că aproape proporțional cu dezvoltarea parcurilor fotovoltaice și eoliene, concept ce face referire la utilizarea spațiului din jurul panourilor fotovoltaice sau din jurul eolienelor pentru culturi agricole sau alte destinații complementare, ceea ce duce la o reteritorializare a terenurilor. Modelul agrofotovoltaic implică integrarea panourilor fotovoltaice cu activitățile agricole pe același teren, optimizând ambele utilizări. Prin implementarea de culturi între panourile fotovoltaice, terenurile care ies din circuitul agricol pot fi revitalizate, prin reteritorializarea parțială. Această abordare combină producția de energie verde cu activitățile agricole, contribuind la utilizarea eficientă a terenurilor și la îmbunătățirea sustenabilității.

În sprijinul susținerii pentru implementarea acestui concept sunt trei argumente principale. Primul este de natură economică și se referă la un potențial de câștig suplimentar pentru deținătorul facilității de transport sau al proprietarului terenului în funcție de forma de investiție sau asociere. Această activitate suplimentară nu poate aduce tot atâta profitabilitate ca și producția de energie (cel puțin în acest moment și context economic), însă fiind un beneficiu suplimentar nu poate fi ignorat de mediul de afaceri, acesta creând simbioza necesară economiei.

Al doilea argument este cel al responsabilității sociale, având în vedere că prin investițiile făcute au fost scoase din circuitul agricol terenuri dealtfel cultivate de localnici, muncite de ei, aceștia rămânând fără activitate lucrativă și în majoritatea cazurilor nici nu se poate vorbi despre o reformare a acestora pentru reintegrare pe piața muncii, fie că este vorba despre vârstă, pregătire sau acces la metode de calificare.

Al treilea element care chiar dacă în general nu este atât de expus public, este foarte important fiindcă reprezintă imaginea pe care o are respectivul investitor în zonă, cu cât mai bună, cu atât influența acestuia va fi mai mare. El este generat de al doilea argument și potențează tot pe cel de-al doilea argument.

Identificarea unor **modele statistico-econometrice** aplicabile pentru reteritorializarea terenurilor, strategiilor agroalimentare și a piețelor implică ca în orice studiu, mai multe etape, începând de la colectarea și pregătirea datelor până la selectarea și calibrarea celor mai potrivite modele econometrice. Scopul acestor modele este de a analiza și de a prezice impactul schimbărilor asupra piețelor și a modului de utilizare a terenurilor, oferind decidenților informații pentru optimizarea strategiilor agroalimentare.

Pentru acest lucru putem să definim cinci etape principale.

Prima etapă este definirea clară a obiectivelor și a variabilelor cheie. Înainte de a alege sau dezvolta un model, este necesar să fie cât mai clar stabilite cel puțin următoarele aspecte identificate. Două întrebări pentru a stabili această primă etapă ar fi:

1. Ce dorește să măsoare modelul?

   De exemplu:

   - Productivitatea agricolă în funcție de reteritorializare?
   - Impactul asupra piețelor agroalimentare?
   - Eficiența utilizării terenurilor pentru culturi și energie regenerabilă?
2. Care sunt variabilele independente și dependente?

- De exemplu, randamentul culturilor (variabilă dependentă) poate fi influențat și sigur este, (însă va fi important de identificat în ce măsură) de variabile independente precum tipul de sol, condițiile climatice, distanța dintre panouri fotovoltaice, grad de umbrire, prețurile de pe piața alimentară, și schimbările în politicile de subvenții.

A doua etapă este identificată pentru colectarea datelor relevante. Aici, calitatea și disponibilitatea datelor reprezintă un factor critic în dezvoltarea modelelor econometrice fiabile. Datele trebuie să fie detaliate, complete și să acopere toate variabilele relevante. Am identificat generic ca necesare pentru acest studiu câteva seturi de date esențiale pentru studiu.

- *Date economice* unde includem date cu privire la prețurile produselor agroalimentare pe piețele locale, regionale și chiar internaționale, dacă este cazul. Totodată, evoluția cererii și ofertei pentru diverse produse agricole. Datele privind subvențiile actuale, viitoare și politicile publice existente în domeniul agroalimentar la nivel regional, național sau internațional, în cazul nostru preponderent strategiile europene.
- *Date agricole* care privesc randamentele culturilor agricole sub diverse scenarii de reteritorializare (tipul de sol, tipul de cultură, umbrirea datorată panourilor fotovoltaice etc.). Raport investiție/volum de muncă/costuri cu forța de muncă/ profitabilitate. Modelele climatice care pot influența productivitatea sunt absolut necesare coroborate cu producerea de potențialele fenomene extreme.
- *Date privind energia regenerabilă* care conțin capacitatea și eficiența panourilor fotovoltaice integrate cu activități agricole. Dacă prin introducerea producției agricole se diminuează rentabilitatea investiției. Costurile și veniturile din producția de energie verde. Eventual raporturi de eficiență după integrarea activităților agricole
- *Date demografice și socio-economice* cu privire la schimbările demografice în zonele rurale afectate de reteritorializare. Veniturile generate de diferitele tipuri de exploatare agricolă și energetică. Nivelul de ocupare a forței de muncă în agricultură și energie verde.

A treia etapă este identificată a fi alegerea unui model econometric adecvat. Modelele econometrice variază în funcție de complexitatea fenomenului pe care îl studiază și de tipul de date disponibile. Cele mai frecvent utilizate modele pentru analiza strategiilor agroalimentare care pot fi utilizate și în cazul reteritorializării includ:

- Regresiile multiple unde includem ca potențial modelele de regresie liniară sau neliniară care pot analiza relația dintre variabilele dependente cum ar fi productivitatea agricolă și variabilele independente de exemplu condițiile de mediu, distanța dintre panouri fotovoltaice și înălțimea de montaj a acestora sau prețul pe piețele agroalimentare. Regresiile logistice fiind deasemenea o variantă de luat în calcul pentru analiza datelor rezultate. Poate intra în evaluare și modul în care modificările într-o anumită variabilă de exemplu subvențiile agricole vor influența rezultatele economice și agricole.
- Modele de analiză a eficienței (DEA sau SFA), Data Envelopment Analysis (DEA) și Stochastic Frontier Analysis (SFA) sunt utile pentru măsurarea eficienței economice a reteritorializării în raport cu exploatarea terenurilor convenționale. Aceste modele permit compararea diferitelor unități de producție cum ar fi fermele sau unități teritoriale, adică regiuni pentru a determina care dintre ele utilizează cel mai eficient resursele.
- Modele de serii temporale cum ar fi Autoregressive Integrated Moving Average (ARIMA) sau Vector Autoregressive (VAR) pot fi folosite pentru prognoza evoluției prețurilor produselor agricole sau energiei în timp, în funcție de tendințele și factorii specifici care afectează cererea și oferta.
- Modele economice computaționale (CGE), Computable General Equilibrium simulează interacțiunile dintre diferite sectoare economice, inclusiv agricultura și energia. Aceste modele sunt utile pentru a evalua impactul sau reacția la nivel macroeconomic al reteritorializării

terenurilor asupra întregii economii și asupra lanțurilor de aprovizionare. Acestea sunt cunoscute și ca modele AGE (applied general equilibrium).

Testarea ipotezelor economice și calibrările rezultatelor ar fi cea de-**a patra etapă** când odată identificat și selectat un model sau mai multe, în funcție de datele rezultate, acestea trebuie testate și calibrate pe baza datelor colectate. Pașii în această etapă includ:

- Testarea ipotezelor econometrice fiindcă modelele econometrice au nevoie de testări prealabile pentru a se verifica dacă îndeplinesc anumite ipoteze statistice, cum ar fi homoscedasticitatea, lipsa de multicoliniaritate și normalitatea erorilor.
- Calibrarea modelelor deoarece modelele trebuie ajustate pentru a reflecta realitatea piețelor agroalimentare locale și regionale, precum și particularitățile specifice regiunii studiate; aici, putem menționa ca exemplu, condițiile de sol și condițiile climaterice.
- Validarea modelului care este esențială și se face prin utilizarea unor seturi de date diferite pentru validarea modelului și verificarea acestuia dacă poate prezice corect rezultatele economice pe termen scurt și lung.

A cincea etapă are ca scop interpretarea rezultatelor și formularea de politici publice. După aplicarea modelelor selecționate, se poate trece la interpretarea rezultatelor și formularea strategiilor de politici publice. Rezultatele econometrice pot evidenția care sunt cele mai eficiente practici agricole în contextul reteritorializării sau cum poate fi optimizată combinația dintre producția agricolă și producția de energie regenerabilă, ori altă soluție cum ar fi modalitatea în care ar trebui ajustate subvențiile și politicile pentru a stimula utilizarea optimă a terenurilor. Totuși un rezultat important este aflarea rezultatului pe care îl are impactul reteritorializării asupra piețelor agroalimentare, în special asupra prețurilor și cererii de pe piața locală și regională.

Există practic și o **a șasea etapă**, ea nefiind menționată ca și etapă inițială în identificarea unor modele statistico-econometrice aplicabile pentru reteritorializarea strategiilor agroalimentare și a piețelor, ea fiind practic o etapă ulterioară ce are ca și scop calibrarea și ajustarea modelelor pe termen lung, fiindcă modelele trebuie recalibrate periodic pentru a reflecta modificările din datele reale, schimbările climatice, economice și politice. Odată cu acumularea de date suplimentare și schimbarea condițiilor de pe piețele agroalimentare, modelele pot fi și trebuie să fie ajustate pentru a oferi predicții și recomandări mai precise.

Concluzii

Pentru identificarea unor modele statistico-econometrice aplicabile pentru reteritorializarea terenurilor, a strategiilor agroalimentare și a piețelor este necesară o abordare sistematică ce include colectarea de date economice, agricole și socio-demografice relevante, urmată de alegerea unor modele econometrice adecvate, cum ar fi regresiile multiple, modelele de eficiență (DEA sau SFA), seriile temporale și modelele computaționale, după care va fi nevoie de testarea, calibrarea și validarea modelelor pentru a obține predicții precise, iar în final interpretarea rezultatelor pentru a sprijini deciziile privind politicile publice și strategiile de dezvoltare sustenabilă.

Acest proces va contribui la optimizarea reteritorializării și la utilizarea terenurilor în mod eficient pentru agricultură și producția de energie regenerabilă. Cu toate acestea, contextul politic și economic actual face destul de greoaie susținerea ritmului de dezvoltare în această industrie.

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IDENTIFICATION OF THE NECESSARY ELEMENTS FOR ESTABLISHING OF THE STATISTICAL-ECONOMETRICAL MODELS APPLICABLE TO THE RETERIORIZATION OF LAND AND AGRICULTURAL STRATEGIES

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Abstract

In the context of increasing energy needs and European policies adopting sustainable development strategies and decarbonization strategies for energy production, significant areas are being displaced from the agricultural circuit, areas that are transferred, in this way, exclusively to investments generating energy from renewable sources, more specifically to photovoltaic parks generating energy produced with the help of the sun and wind parks, generating energy from the speed of the wind. Reterritorialization represents a viable solution to reduce the deficit produced by the agricultural fund by displacing land areas from the agricultural circuit and to participate and continue to support sustainable development and the concept of sustainability.

The global context has, in addition to the elements of sustainability and the environment, supported by the concept of sustainable development, also elements of energy security of the states. Romania and the other European states are involved in the development process of this branch of the energy industry with clear progress targets. Equally, the aim is to reduce dependence on energy solutions from Russia, i.e. gas imported by both Romania and Europe, as well as the dependence of this industry on the Chinese supply chain, the provision of infrastructure elements being made almost exclusively by Chinese manufacturers.

In this article, the author set out to identify the elements necessary to establish some statistical-econometric models that are optimal and applicable to the concept of land reterritorialization. The concept of reterritorialization emerged in the context of the dynamic development of the renewable energy field, namely photovoltaic parks, but not only being applicable to wind energy parks. The major developers and investors of these energy producing establishments have displaced significant areas from agricultural circuits for the development of these investments. National energy needs are a priority in the economy due to sustainable development strategies, which are even part of European strategies. Agriculture is part of the essential needs of humanity, which makes it equally a strategic economic branch.

In order to emphasize the importance that should be given to this subject and to argue this, the article presents some relevant statistical data to identify developments. Agriculture has been facing difficulties generated by climate change in recent years, such as drought, floods, abrupt temperature variations and, last but not least, extreme phenomena, which have become increasingly frequent, these being part of the unpredictable category, generating significant losses for farmers once they occur. At the same time, we can say that in Romania, the irrigated area has decreased dramatically.

Keywords: sustainability, agrophotovoltaic model, green energy, sustainable development, econometric model.

JEL Classification: C10, O13, Q56.

Introduction

The concept of reterritorialization based on the agrophotovoltaic concept has as its principle the use of unused space around photovoltaic panels for agricultural crops or other complementary purposes, which leads to a partial reuse of land. This approach symbiotically combines green energy production with agricultural activities, creating a synergy between renewable energy production and agriculture, contributing to a greener and more resilient economy, contributing to the efficient use of land. By implementing various crops between photovoltaic panels, land that has been removed from agricultural use for energy production can be partially revitalized.

The agrophotovoltaic model integrates photovoltaic panels with agricultural activities on the same land, optimizing both uses. In order to effectively implement such a system, it is essential to consider both the technical aspects of installing photovoltaic panels, as well as the space available for crops and the climate and soil conditions.

At the level of further development, it would be necessary to take into account from the design phase the elements necessary for the efficient and sustainable use of land in accordance with sustainable development strategies. In the case of wind farms, the concept of reterritorialization should also be implemented as a mandatory element from the design stage, given the large distances required between wind turbines. The remaining available spaces for reterritorialization are proportionally much larger than the technological space required for wind turbines. We must not lose sight of the enormous available space on which the development of wind farms is based, this land being also extracted from the agricultural circuit, causing a decrease in cultivated land areas, and consequently of the food-generating infrastructure for the ever-growing population.

Literature review

Angelsen (2010) presented a series of elements that are taken into account in what agricultural production means, and Anghel, Anghelache and Panait (2017) analyzed the results obtained in agriculture in the European Union, both as a whole and for each member state. Anghelache, Samson and Stoica (2020) analyzed the main elements of the European Union strategy regarding the agricultural sector. Anghelache and Dumitrescu (2015) analyzed agricultural production indices. Anghelache, Strijek and Dumitru (2024) analyzed the dynamics of plant production in Romania of the main crops in 2023. Bezemer and Headey (2008) addressed aspects regarding the measures that can be implemented for the development of agriculture. Quamrul and Michalopoulos (2015) researched the implications of climate fluctuations on agriculture. Swintona, Lupi, Robertson, Hamilton (2007) analyzed the role of agricultural ecosystems for various benefits. Strijek D (2024), presented the importance of energy in industrial production.

Thus, Anghelache C. and Anghel M.G. (2024) address a sensitive issue regarding the European Union's dependence on single suppliers, which is an issue of concern and constitutes a fundamental component of energy security. Best R. (2017) studies the importance of financial capital and its influence in development considering the consumption of different types of energy: biofuels and waste, hydro, coal, oil, natural gas, nuclear, wind, solar and geothermal. Cheikh N.B., Zaied Y.B. (2024) are concerned with the dynamic interdependence between renewable energy sources and its main drivers, emphasizing the role of geopolitical events. Correlj A., Hoppe T., Künneke R. (2024) have a multidisciplinary analytical perspective, which addresses governance, institutional and ethical aspects, regarding the involvement of citizens in sustainable urban energy systems, starting from the reality that cities are directly involved in the emission of approximately 75% of the total global CO2 emissions. The transport and construction sectors are the largest contributors in this regard. Deleidi M., Mazzucato M., Semieniuk G. (2020) have examined the effect of direct public investments on private investments regarding

renewable energy production technologies. Husain S., Sohag K., Wu Y. (2024) are concerned with the effectiveness of environmental policies in promoting renewable energy production, conducting a study in this regard using the CS-ARDL estimation method, which is a more advanced version of the group average estimation method. Iacob and Strijek (2024) also explore in their work the importance of sustainable development and its key elements, and Strijek (2024) makes known the importance of reterritorialization as part of sustainable development and the recovery of agricultural land in the context of the symbiosis of two strategic areas. The data envelopment (DEA) methodology was developed and presented by Charnes, Cooper and Rhodes (1978) and was later deepened by Banker, Charnes and Cooper (1984).

Methodology, data, results and discussions

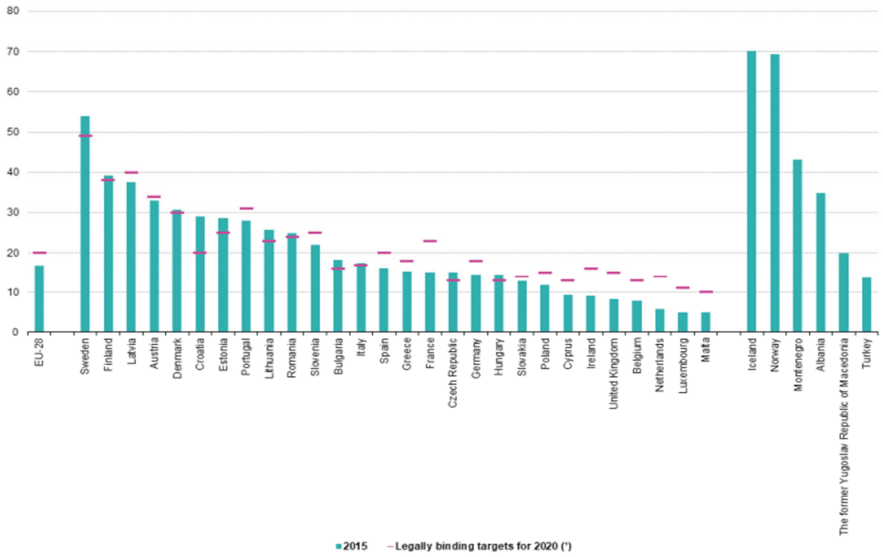
Considering all the above elements, the question arises as to how we need to approach the problem in order to find a suitable solution. Thus, the idea is developed to identify statistical-econometric models applicable to the reterritorialization of land and agricultural agri-food strategies. This is part of a larger study because it contains extremely many variables that influence the applicable results.

We can also say that development strategies are sometimes focused on one field, or industry without taking into account its effects in relation to the others, or omitting some of the three industries. For example, we can consider the energy industry and the high need for its development to satisfy the increasing consumption necessary for today's society. Starting with the industries producing and processing goods, services provided to the population, up to the increased need for charging electric cars.

European countries have set themselves, within the framework of sustainable development strategies, objectives and targets for the production of energy from renewable sources, these being attributed mainly to wind production sources, but especially solar.

Certainly, the production from these sources will increase, the guarantee being the commitments assumed by the European states which are presented below in figure no. 1:

Green energy production and assumed objectives



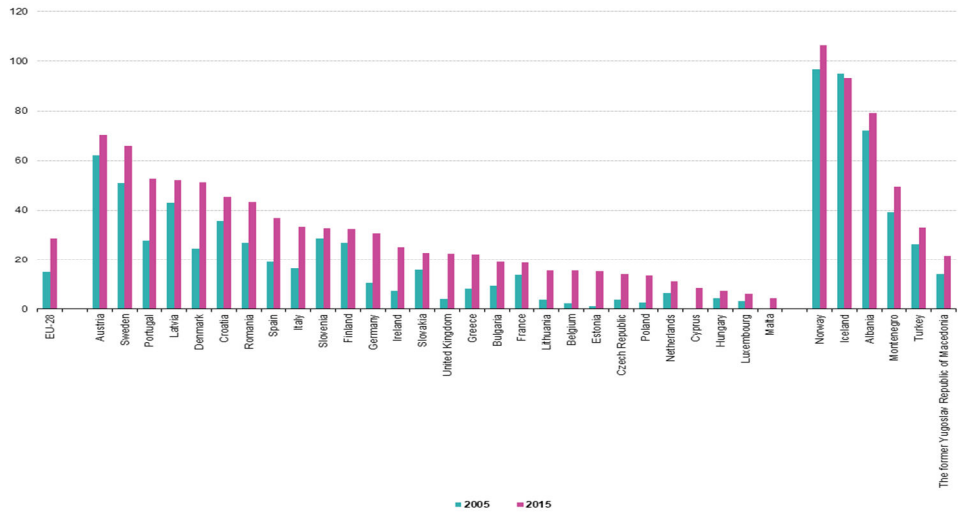
Source: Eurostat

Europe's climate commitments and the concern for renewable, sustainable energy sources are sustained over time, with Europe being an important player in the climate pact.

In this context, Romania ranks among the first places, being among the countries that have exceeded their assumed objectives in renewable energy production, above the European average. To support this argument, figure no. 2, presented below, presents the share of electricity generated from renewable sources in 2005 and 2015, with a significant increase evident.

Share of electricity generated from renewable sources, 2005 and 2015

Figure no. 2



Sursa: Eurostat

Following the Covid-19 pandemic, the European economy has been severely affected. The European Commission, in accordance with the adopted European Green Deal, has assumed an ecological approach to economic recovery, but even if the political will exists, the investments that are necessary for the recovery after the pandemic episode and, implicitly, the expenses necessary to mitigate the consequences of the ongoing war, have the effect of slowing down the implementation of ecological policies and commitments, and the recovery is being done by sacrificing some ecological considerations. The new decisions at the European level certify that the decarbonization targets were too idealistic and in fact affected industries, added production costs and caused important players in key development areas to become uncompetitive and lose their economic advantages. Moreover, some of them were forced to restrict their activity. This decision to reanalyze the targets, direction and speed of development also comes from the new directions that the United States of America is giving with the re-election of President Trump.

The US decision to rejoin the Paris Agreement, under Joe Biden's presidency and the organization of an international climate summit, brought hope, showing the world a significant shift from President Trump's first-term policy, indicating at the time that the US was on a trajectory of climate-friendly commitments. However, implementing long-term climate action in the US remained a challenge, given the depth of political divisions at the time and strong opposition from influential forces, with China and other Asian economies accounting for most of the global growth in the coal sector. Commitments to climate neutrality by several Asian countries, however, suggest a move towards greater

emission reductions, but even the largest players have set long deadlines, 2060 for China and 2070 for India. The pace of change remains uncertain given the long deadlines and the instability of policymakers. However, given the re-election of Donald Trump as US president and his immediate decision to withdraw the US from the climate pact again, immediately after taking office, the prospects for green energy are truly uncertain. The need for investment in order to produce energy predominantly from renewable sources is great, and a major player in the industry such as the US can tip the balance in the opposite direction of sustainability.

We note that most of the time immediate economic interests or political decision-makers mistakenly change the optimal development path, which also happened in this case, where the increased need for energy has tainted the path of the sustainable development strategy for decarbonization and has removed significant areas from the agricultural circuit for the development of renewable energy production facilities.

As we have shown in the figures above, Romania has recorded a significant development in the renewable energy sector, making it necessary to take out of the agricultural circuit, in addition to the necessary investments, significant areas of land where these investments could be made, which would otherwise have been used for agricultural production. Even if in some agricultural sectors, modern techniques and advanced machinery have led to an increase in profitability, this cannot compensate for the lack of land in use. This direction of development was the trigger for the concept of reterritorialization.

In recent times, the concept of reterritorialization has developed quite a lot, and it can even be said that it is almost proportional to the development of photovoltaic and wind farms, a concept that refers to the use of the space around photovoltaic panels or wind turbines for agricultural crops or other complementary purposes, which leads to a reterritorialization of land. The agrophotovoltaic model involves the integration of photovoltaic panels with agricultural activities on the same land, optimizing both uses. By implementing crops between photovoltaic panels, land that is no longer used for agriculture can be revitalized, through partial reterritorialization. This approach combines green energy production with agricultural activities, contributing to efficient land use and improving sustainability.

There are three main arguments in support of supporting the implementation of this concept. The first is of an economic nature and refers to an additional earning potential for the owner of the transport facility or the owner of the land depending on the form of investment or association. This additional activity cannot bring as much profitability as energy production (at least at this time and economic context), but being an additional benefit, it cannot be ignored by the business environment, as it creates the symbiosis necessary for the economy.

The second argument is that of social responsibility, given that through the investments made, lands that were otherwise cultivated by locals, worked by them, were removed from the agricultural circuit, leaving them without gainful activity and in most cases there can be no talk of their reformation for reintegration into the labor market, whether it is about age, training or access to qualification methods.

The third element, even if it is generally not so publicly exposed, is very important because it represents the image that the respective investor has in the area, the better it is, the greater its influence will be. It is generated by the second argument and also potentiates the second argument.

Identifying **statistical-econometric models** applicable to the reterritorialization of land, agri-food strategies and markets involves, as in any study, several stages, starting from the collection and preparation of data to the selection and calibration of the most appropriate econometric models. The purpose of these models is to analyze and predict the impact of changes on markets and land use, providing decision-makers with information to optimize agri-food strategies.

For this, we can define five main stages.

The first stage is the clear definition of the objectives and key variables. Before choosing or developing a model, it is necessary to establish as clearly as possible at least the following identified aspects. Two questions to establish this first stage would be:

1. What does the model want to measure?

For example:

- Agricultural productivity as a function of reterritorialization?
- Impact on agri-food markets?
- Land use efficiency for crops and renewable energy?

2. What are the independent and dependent variables?

- For example, the crop yield (dependent variable) can and certainly is influenced (but it will be important to identify to what extent) by independent variables such as soil type, climatic conditions, distance between photovoltaic panels, degree of shading, food market prices, and changes in subsidy policies..

The second stage is identified for the collection of relevant data. Here, the quality and availability of data is a critical factor in the development of reliable econometric models. The data must be detailed, complete and cover all relevant variables. We have generically identified several essential data sets for the study as necessary for this study.

- *Economic data* where we include data on the prices of agri-food products on local, regional and even international markets, if applicable. At the same time, the evolution of demand and supply for various agricultural products. Data on current and future subsidies and existing public policies in the agri-food field at regional, national or international level, in our case mainly European strategies.
- *Agricultural data* regarding the yields of agricultural crops under various reterritorialization scenarios (soil type, crop type, shading due to photovoltaic panels, etc.). Investment / work volume/ labor costs / profitability ratio. Climate models that can influence productivity are absolutely necessary in conjunction with the production of potential extreme phenomena.
- *Data on renewable energy* containing the capacity and efficiency of photovoltaic panels integrated with agricultural activities. If the introduction of agricultural production reduces the return on investment. Costs and revenues from green energy production. Possibly efficiency ratios after the integration of agricultural activities
- *Demographic and socio-economic data* on demographic changes in rural areas affected by reterritorialization. Income generated by different types of agricultural and energy exploitation. Employment level in agriculture and green energy.

The third step is identified as the choice of an appropriate econometric model. Econometric models vary depending on the complexity of the phenomenon being studied and the type of data available. The most commonly used models for the analysis of agri-food strategies that can also be used in the case of reterritorialization include:

- Multiple regressions where we potentially include linear or nonlinear regression models that can analyze the relationship between dependent variables such as agricultural productivity and independent variables such as environmental conditions, the distance between photovoltaic panels and their mounting height or the price on agri-food markets. Logistic regressions are also a variant to consider for analyzing the resulting data. It can also be evaluated how changes in a certain variable such as agricultural subsidies will influence economic and agricultural results.
- Efficiency analysis models (DEA or SFA), Data Envelopment Analysis (DEA) and Stochastic Frontier Analysis (SFA) are useful for measuring the economic efficiency of reterritorialization in relation to conventional land use. These models allow the comparison of different production units such as farms or territorial units, i.e. regions, to determine which of them uses resources most efficiently.

- Time series models such as Autoregressive Integrated Moving Average (ARIMA) or Vector Autoregressive (VAR) can be used to forecast the evolution of agricultural or energy prices over time, depending on specific trends and factors affecting demand and supply.
- Computational economic models (CGE), Computable General Equilibrium simulate the interactions between different economic sectors, including agriculture and energy. These models are useful for assessing the macroeconomic impact or response of land reterritorialization on the entire economy and supply chains. These are also known as AGE (applied general equilibrium) models.

Testing economic hypotheses and calibrating results would be **the fourth stage** when once one or more models have been identified and selected, depending on the resulting data, they must be tested and calibrated based on the data collected. The steps in this stage include:

- Testing econometric hypotheses because econometric models need prior testing to verify that they meet certain statistical assumptions, such as homoscedasticity, lack of multicollinearity and normality of errors.
- Calibrating models because models must be adjusted to reflect the reality of local and regional agri-food markets, as well as the specific characteristics of the region studied; here, we can mention as an example, soil conditions and climatic conditions.
- Validating the model which is essential and is done by using different data sets to validate the model and verifying whether it can correctly predict economic outcomes in the short and long term..

The fifth stage aims at interpreting the results and formulating public policies. After applying the selected models, one can proceed to interpreting the results and formulating public policy strategies. The econometric results can highlight which are the most efficient agricultural practices in the context of reterritorialization or how the combination of agricultural production and renewable energy production can be optimized, or another solution such as how subsidies and policies should be adjusted to stimulate optimal land use. However, an important result is to find out the impact of reterritorialization on agri-food markets, especially on prices and demand on the local and regional market.

There is practically a sixth stage, not being mentioned as an initial stage in identifying statistical-econometric models applicable for the reterritorialization of agri-food strategies and markets, it is practically a subsequent stage aimed at calibrating and adjusting the models in the long term, because the models must be recalibrated periodically to reflect changes in real data, climatic, economic and political changes. With the accumulation of additional data and changing conditions on agri-food markets, the models can and must be adjusted to provide more precise predictions and recommendations.

Conclusions

To identify applicable statistical-econometric models for land reterritorialization, agri-food strategies and markets, a systematic approach is required that includes the collection of relevant economic, agricultural and socio-demographic data, followed by the selection of appropriate econometric models, such as multiple regressions, efficiency models (DEA or SFA), time series and computational models, after which the testing, calibration and validation of the models will be needed to obtain accurate predictions, and finally the interpretation of the results to support decisions on public policies and sustainable development strategies.

This process will contribute to the optimization of reterritorialization and the efficient use of land for agriculture and renewable energy production. However, the current political and economic context makes it quite difficult to sustain the pace of development in this industry.

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Managementul turismului explicat în România cu ajutorul indicatorilor turistici în turismul rural

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Abstract

Turismul rural este în plină dezvoltare la nivel european, cu precădere în România. Mediul rural în care sunt amplasate unitățile de cazare ecologice și agro-turistice este cunoscut în Uniunea Europeană ca fiind o oază de relaxare pentru turiștii români și străini. Serviciile de cazare cu diverse specificități sunt evaluate constant de către specialiști oferind turiștilor siguranța petrecerii timpului de recreere, recuperare, relaxare în condiții de înnoptare optimă, în ecoturismul românesc.

Evoluția ecoturismului a presupus schimbări ale structurilor de cazare prin instrumente inteligente de electrificare a ariilor protejate, a spațiilor de cazare, a spațiilor de agrement. De asemenea, dotarea unităților de cazare cu obiecte de mobilier tradiționalist este necesară pentru etichetarea ecoturistică specifică țărilor din Uniunea Europeană.

Atât numărul de sosiri de turiști, cât și numărul de înnoptări depinde de indicele calității serviciilor de cazare înregistrat în România.

Cuvinte cheie: ecoturism, turism rural, managementul turismului, turism durabil.

Clasificarea JEL: M00, M01, M11.

Introducere

Analiza managementului turismului a fost efectuată utilizând rezultatele modelului de regresie liniară simplă din articolele prezentate anterior, în contextele economice prezente în anii 2023, 2024, prin care se corelează indicii turismului de masă și indicii turismului de nișă.

În literatura de specialitate, turismul responsabil este definit ca fiind o formă de turism axat pe principiile de protejare a ariilor naturale susținute de infrastructura ecoturistică națională.

Responsabilizarea socială a ecoturismului implică adoptarea de măsuri pentru dezvoltarea turismului responsabil național. În județele cu cerere ecoturistică, se pune accent pe măsuri de îmbunătățire a serviciilor ecoturistice, pentru ca turismul durabil național să-și urmeze evoluția în timp. Oferta turistică în țară este diversificată, apărând în piața serviciilor turistice, jucători importanți în: turismul rural, agroturism, ecoturism. Numărul de înnoptări în unitățile de cazare ecoturistică este în creștere continuă, bazele de cazare agroturistică și ecoturistică având o frecvență din ce în ce mai mare.

Cererea turistică este în continuă creștere, cu aproximativ 8%, de la an la an, în ultimul deceniu. Oferta turistică rurală a crescut cu aproximativ 28%, unitățile de cazare fiind cu 32% mai multe în 2023, comparativ cu cele înregistrate în anii 2020-2022 în județele Covasna, Harghita, Maramureș, Brașov.

În România, turismul rural deține o pondere mică în turismul de masă, competitorii la nivel european implementând strategiile de dezvoltare turistică existente în strategiile de dezvoltare economică națională.

Asociația de Ecoturism din România precizează faptul că, turismul verde îndeplinește condițiile de conservare a resurselor naturale, utilizând resursele locale (financiare, umane, informaționale, materiale). De asemenea, reprezintă măsuri pentru implementarea unui turism durabil, deținerea unui caracter educațional în spirit ecologist.

O altă cale managerială inteligentă este respectarea naturii prin conştientizarea turiştilor şi a comunităţilor locale. Reducerea la nivel minim a tuturor activităților turistice care ar putea afecta natura, mediul cultural şi cel social este o măsură de protejare a ariilor naturale existente în România.

În lucrarea *Transformarea lumii noastre: Agenda 2030 pentru dezvoltarea durabilă. A/RES/70/1,* realizată de Organizația Națiunilor Unite (sustainabledevelopment.un.org accesat 25.02.2024) unul din obiectivele managementului turismului durabil este conservarea patrimoniului natural al zonei turistice. Obiectivele turismului responsabil vizează ”*Protejarea, restaurarea și promovarea utilizării durabile a ecosistemelor terestre, gestionarea durabilă a pădurilor, combaterea deșertificării, stoparea și inversarea procesului de degradare a solului și stoparea declinului biodiversității”* (sustainabledevelopment.un.org accesat 20.02.2024). În țară, se încearcă implementarea programelor de protejare a ariilor naturale specifice ecoturismului prin activități de conservare a mediului înconjurător exploatat în sens agroturistic. Printre principalele atracții ecoturistice se numără obiectivele turistice din zonele montane ale țării, arii naturale în care turistul experimentează recuperarea forței de muncă în zonele ecoturistice montane. Ecoturismul românesc este într-un trend ascendent în ultimul deceniu, însă evoluția de la un an la altul este în procent mic.

Metodologia cercetării, date, rezultate şi discuţii

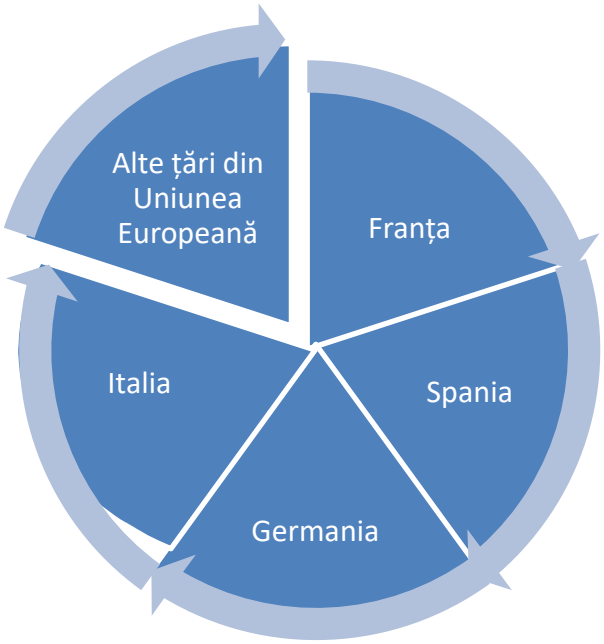
1. Analiza evoluției indicatorilor turistici înregistrați în perioada 2019-2024

În clasamentul economiilor țărilor Uniunii Europene, veniturile încasate din turismul european reprezintă un segment de 30%.

Piața muncii în industria turistică în Uniunea Europeană este în continuă dezvoltare, Franța, Germania, Italia și Spania ocupând primele poziții de primire a turiștilor străini și naționali.

Clasamentul principalelor țări europene care înregistrează cel mai mare număr de turiști străini și naționali din Uniunea Europeană

Figura nr. 1



Sursa: realizat de către autor.

2. Evoluția venitului mediu pe salariat în unitățile de cazare specifice turismului rural din România

Autorul studiază evoluția venitului mediu net anual pe salariat, în perioada 2019-2024, indicator prezentat în Tabelul nr. 1:

Evoluția Venitului mediu net anual pe salariat, în perioada 2019-2024

Tabelul nr. 1

Perioada analizată	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Venit mediu net anual pe salariat (RON)	5165	5432	5472	5423	5381	5279

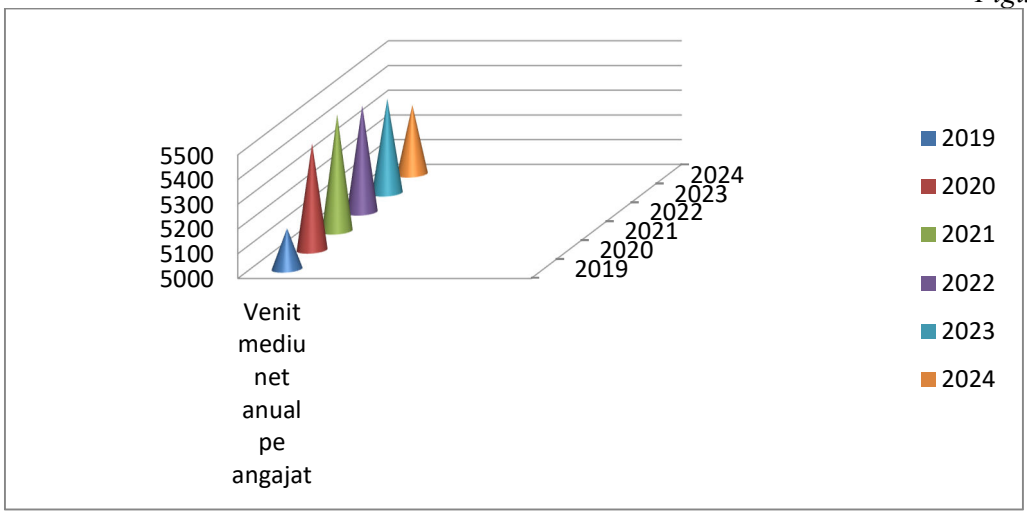
Sursa: TempoOnline, Institutul Național de Statistică

În Tabelul nr. 1, se poate observa media veniturilor nete lunare pe salariat înregistrate în perioada menționată. Începând cu anul 2020, veniturile medii nete au crescut până în anul 2022, urmând o scădere treptată în anii 2023 și 2024, efecte ce influențează puterea de cumpărare a pachetelor ecoturistice românești din județele: Brașov, Covasna, Harghita, Maramureș, Sibiu, Cluj.

În Figura nr. 2 este prezentată evoluția venitului mediu net anual pe angajat:

Evoluția venitului mediu net anual pe angajat, în România, în perioada 2019-2024

Figura nr. 2



Sursa: realizat de către autor.

În studiul realizat, turiștii români își rezervă aproximativ 24% din venitul net obținut, în scopul vacanțelor anuale în zonele turistice de interes educațional și recreativ.

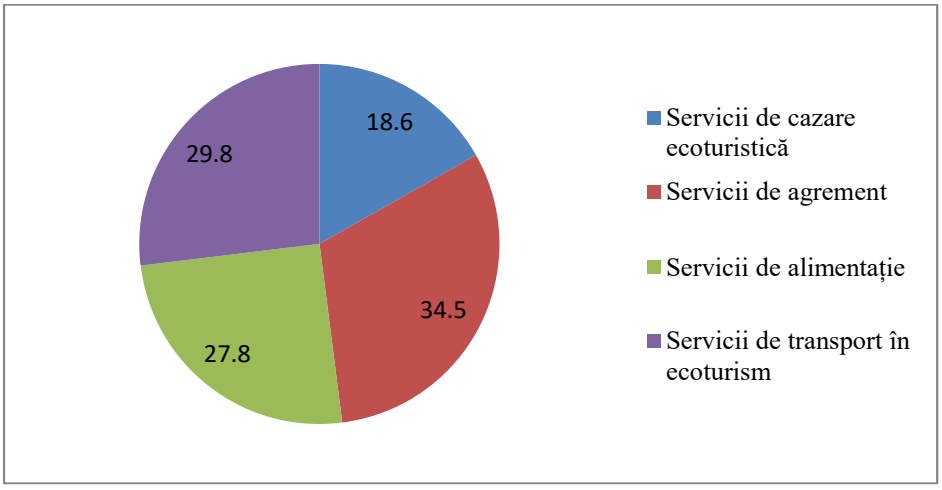
Se poate observa că venitul mediu net anual pe salariat a crescut în ultimul deceniu, fapt ce contribuie la creșterea calității vieții profesionale a angajatului. Indicatorul studiat este prevăzut în continuă evoluție în următorii ani, trendul înregistrat având o creștere constantă.

Serviciile de agrement sunt cele mai căutate de turiștii români, deoarece contribuie la recuperarea forței de muncă a angajatului. Serviciile de alimentație cu specific românesc sunt din ce în ce mai accesate de către turiștii străini și români, bucătăria românească fiind printre cele mai apreciate la nivel mondial.

În Figura nr. 3 este prezentată structura serviciilor ecoturistice de cazare în România, în anul 2024:

Structura serviciilor de cazare ecoturistică în România, în anul 2024

Figura nr. 3



Sursa: realizat de către autor.

În urma rezultatelor evaluărilor serviciilor ecoturistice, în perioada 2020-2024, autorul propune o serie de măsuri de îmbunătățire a calității serviciilor ecoturistice din mediul rural românesc pentru a

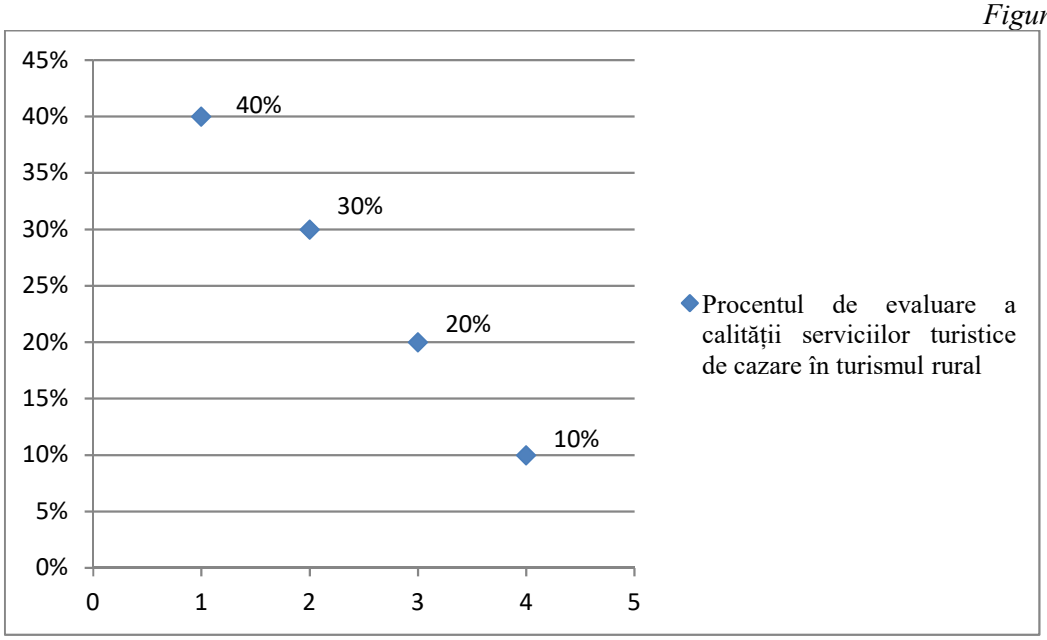
atrage mai mulți turiști străini, condițiile de cazare ecoturistică fiind în prezent evaluate ca fiind: 40%"-Slab" , 30%"- Satisfăcător", 20%- "Bine" și 10%- "Foarte bine".
Serviciile de alimentație în ecoturism sunt cuantificate în procent de 78% cu calificativul "Satisfăcător", rezultat ce scoate în evidență lipsa ingredientelor "Bio" în prepararea meniurilor turiștilor prezenți în unitățile de cazare ecoturistică.

Problematica dezvoltării domeniului agroturistic și a celui ecoturistic prin creșterea nivelului calității serviciilor turistice oferite este dezbatută la nivel mondial. În plan european, serviciile ecoturistice înregistrează un trend evolutiv continuu. În plan național, serviciile turistice de masă sunt mai căutate de către turiștii români.

Printre serviciile de transport ecoturistic se numără: servicii de transport cu șareta, servicii de echitație, servicii de cicloturism, acestea desfășurându-se în zone montane în care se desfășoară activități turistice rurale. În județele Covasna, Harghita, Brașov, Maramureș, serviciile de cazare ecoturistică s-au dezvoltat inteligent prin programele naționale "SMART Tourism" și Start-Up Nation.

Evaluarea calității serviciilor turistice de cazare în turismul rural, în perioada 2020-2024

Figura nr. 4



Sursa: realizat de către autor.

Comparativ cu nivelul calității serviciilor de cazare agroturistice înregistrate în perioada 2007-2016, s-a observat o evoluție lentă a nivelului calității serviciilor ecoturistice românești, comparativ cu situația înregistrată în Uniunea Europeană, în perioada 2020-2024.

În acest sens, autorul a propus îmbunătățirea serviciilor turistice rurale, prin îmbunătățirea serviciilor de cazare în unitățile de cazare din comunitățile rurale în care se desfășoară activitățile economice ecoturistice.

Calitatea serviciilor ecoturistice este definită ca fiind atuul succesului în ceea ce privește desfășurarea activității de ecoturism în condiții optime. În același timp, satisfacerea maximă a nevoii ecoturistului și încercarea de a obține zero defecte ale serviciilor turistice naționale. Diversificarea serviciilor ecoturistice este esențială in turismul european, național, regional și local.

Orientarea spre nevoile turistului, spre a satisface maxim cererea turistică sunt obiective strategice în tacticile manageriale în turism. Se solicită o atenție sporită din partea prestatorilor de servicii ecoturistice, iar orientarea pe produsul ecoturistic este dependentă de cea mentionată mai sus.

Conform datelor prezentate în cercetările anterioare. capacitatea de cazare din mediul rural atinge cota maximă de 5858656 locuri în pensiunile agroturistice, în anul 2021, fapt ce conduce la creșterea cererii turistice rurale și ecoturistice. Campingurile, aproape că și-au triplat numărul de locuri din 2019 până în 2024, informație ce denotă un interes crescut al turistului manifestat pentru protejarea naturii, și totodată, valorificarea acesteia.

Concluzii

Responsabilizarea socială a ecoturismului din viitor implică adoptarea unei noi paradigme care îndeamnă la inovare, atât pentru administrațiile publice, cât și pentru afacerile în turism. Consumatorii tradiționali ai turismului se implică în fiecare an în agroturism, cumpărând servicii turistice de cazare, agrement, alimentație și transport specific ecoturismului.

Strategiile de branding ale pachetelor turistice constituie primul pas ce trebuie făcut pentru atingerea obiectivelor turistice inteligente. Etichetarea ecoturistică a unor asemenea pachete turistice presupune, în primul rând, reputație în ecoturism și prestigiu în inovarea serviciilor ecoturistice durabile și responsabile. Efectele turismului verde internațional se regăsesc în cifra de afaceri a fiecărei unități de cazare ecoturistice din țară.

Această formă de turism rural se poate defini ca fiind *turism responsabil*, deoarece protejează atât consumatorul final, cât și comunitatea locală. Printre obiectivele turismului responsabil se numără implementarea și dezvoltarea turismului verde care conduce la sprijinirea *turismului durabil*.

Stilul de viață al cumpărătorilor de servicii ecoturistice s-a schimbat. Mass-media tradițională este din ce în ce mai slab echipată pentru a susține construcția unui brand pe coordonate emoționale și naționaliste în turismul rural românesc. Promovarea produselor se face prin expunerea pachetelor turistice cu ajutorul tehnologiei moderne. Utilizarea internetului și rețelelor de socializare au un impact major asupra cererii turistice, deoarece informația circulă rapid pe mari distanțe și în medii sociale diferite.

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TOURISM MANAGEMENT EXPLAINED IN ROMANIA BASED ON THE TOURISM INDICATORS IN RURAL TOURISM

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Abstract

The rural tourism is in full development at European level, especially in Romania. The rural environment in which ecological and agro-tourism accommodation units are located is known in the European Union as an oasis of relaxation for Romanian and foreign tourists. Accommodation services with various specificities are constantly evaluated by specialists, offering tourists the security of spending their time for recreation, recovery, relaxation in optimal overnight conditions, in Romanian ecotourism.

The evolution of ecotourism has involved changes in accommodation structures through intelligent tools for electrifying protected areas, accommodation spaces, and leisure spaces. Also, equipping accommodation units with traditional furniture is necessary for the ecotourism labeling specific to European Union countries.

Both the number of tourist arrivals and the number of overnight stays depend on the quality index of accommodation services registered in Romania.

Keywords: ecotourism, rural tourism, tourism management, sustainable tourism.
JEL Classification: M00, M01, M11.

Introduction

The analysis of tourism management was carried out using the results of the simple linear regression model from the previously presented articles, in the economic contexts present in the years 2023, 2024, through which the mass tourism indices and niche tourism indices are correlated.
In the specialized literature, responsible tourism is defined as a form of tourism focused on the principles of protecting natural areas supported by the national ecotourism infrastructure.

The social accountability of ecotourism involves the adoption of measures for the development of national responsible tourism. In counties with ecotourism demand, emphasis is placed on measures to improve ecotourism services, so that national sustainable tourism can follow its evolution over time.

The tourism offer in the country is diversified, with important players appearing in the tourism services market in: rural tourism, agrotourism, ecotourism. The number of overnight stays in ecotourism accommodation units is continuously increasing, with agrotourism and ecotourism accommodation bases having an increasing frequency.

Tourism demand is continuously increasing, by approximately 8%, year on year, in the last decade. The rural tourism offer increased by approximately 28%, with accommodation units being 32% more in 2023, compared to those recorded in 2020-2022 in the counties of Covasna, Harghita, Maramureș, Brașov.

In Romania, the rural tourism has a small share in mass tourism, with competitors at European level implementing existing tourism development strategies in national economic development strategies.

The Romanian Ecotourism Association states that green tourism meets the conditions for conserving natural resources, using local resources (financial, human, informational, material). It also represents measures for the implementation of sustainable tourism, having an educational character in an ecological spirit.

Another intelligent management path is to respect nature by raising awareness among tourists and local communities. Minimizing all tourism activities that could affect nature, the cultural and social environment is a measure to protect existing natural areas in Romania.

In the work *Transforming our world: The 2030 Agenda for Sustainable Development. A/RES/70/1*, produced by the United Nations (sustainabledevelopment.un.org accessed 25.02.2024) one of the objectives of sustainable tourism management is the conservation of the natural heritage of the tourist area. The objectives of responsible tourism aim to *"Protect, restore and promote the sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and halt the decline of biodiversity"* (sustainabledevelopment.un.org accessed 20.02.2024). In the country, attempts are being made to implement programs to protect natural areas specific to ecotourism through activities to conserve the environment exploited in an agrotourism sense. Among the main ecotourism attractions are the tourist attractions in the country's mountainous areas, natural areas where tourists experience the recovery of labor in mountain ecotourism areas. Romanian ecotourism has been on an upward trend in the last decade, but the evolution from one year to the next is in a small percentage.

Research methodology, data, results and discussions

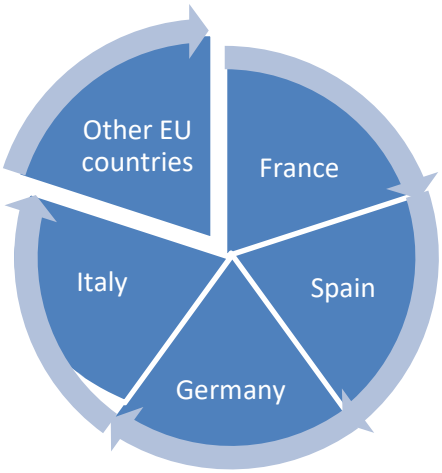
1. Analysis of the evolution of tourism indicators recorded during the period 2019-2024

In the ranking of the economies of the European Union countries, the income collected from European tourism represents a 30% segment.

The labor market in the tourism industry in the European Union is continuously developing, with France, Germany, Italy and Spain occupying the first positions in receiving foreign and national tourists

Ranking of the main European countries that register the largest number of foreign and national tourists in the European Union

Figure no. 1



Source: created by the author.

2. Evolution of average income per employee in rural tourism accommodation units in Romania

The author studies the evolution of the average annual net income per employee, during the period 2019-2024, an indicator presented in Table no. 1:

Evolution of the average annual net income per employee, during the period 2019-2024

Table no. 1

Period analyzed	2019	2020	2021	2022	2023	2024
Average annual net income per employee (RON)	5165	5432	5472	5423	5381	5279

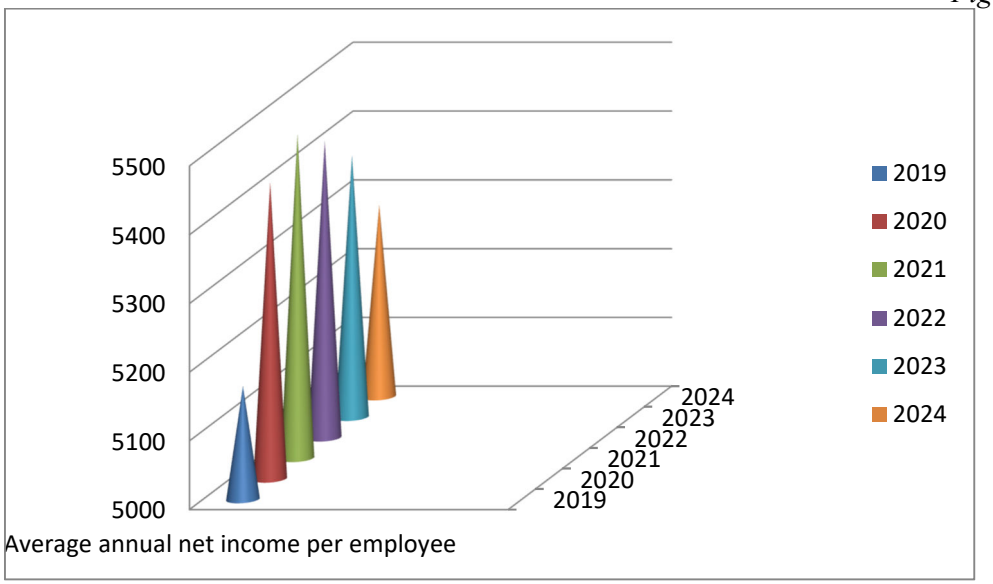
Source: TempoOnline, National Institute of Statistics.

In Table no. 1, the average monthly net income per employee recorded during the mentioned period can be observed. Starting with 2020, average net income increased until 2022, followed by a gradual decrease in 2023 and 2024, effects that influence the purchasing power of Romanian ecotourism packages in the counties: Brașov, Covasna, Harghita, Maramureș, Sibiu, Cluj.

In Figure no. 2, the evolution of the average annual net income per employee is presented:

Evoluția venitului mediu net anual pe angajat, în România, în perioada 2019-2024

Figura nr. 2



Source: created by the author.

In the study conducted, Romanian tourists reserve approximately 24% of their net income for annual vacations in tourist areas of educational and recreational interest.

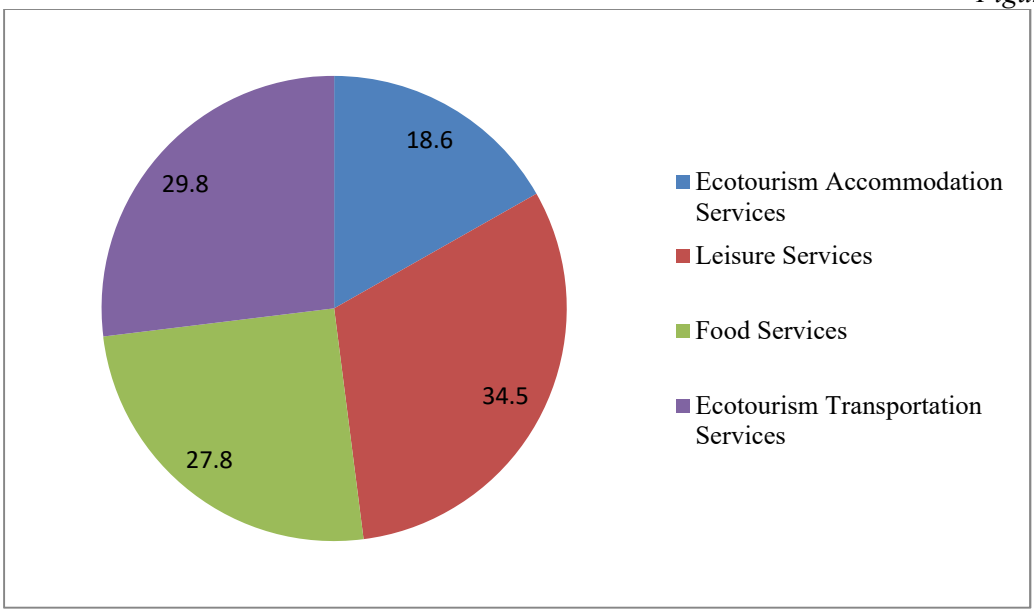
It can be seen that the average annual net income per employee has increased in the last decade, which contributes to increasing the quality of the employee's professional life. The studied indicator is expected to continue evolving in the coming years, with the trend recorded showing a constant increase.

Leisure services are the most sought after by Romanian tourists, as they contribute to the recovery of the employee's workforce. Romanian-specific food services are increasingly accessed by foreign and Romanian tourists, Romanian cuisine being among the most appreciated worldwide.

Figure no. 3 presents the structure of ecotourism accommodation services in Romania in 2024:

Structure of ecotourism accommodation services in Romania, in 2024

Figure no. 3



Sursa: realizat de către autor.

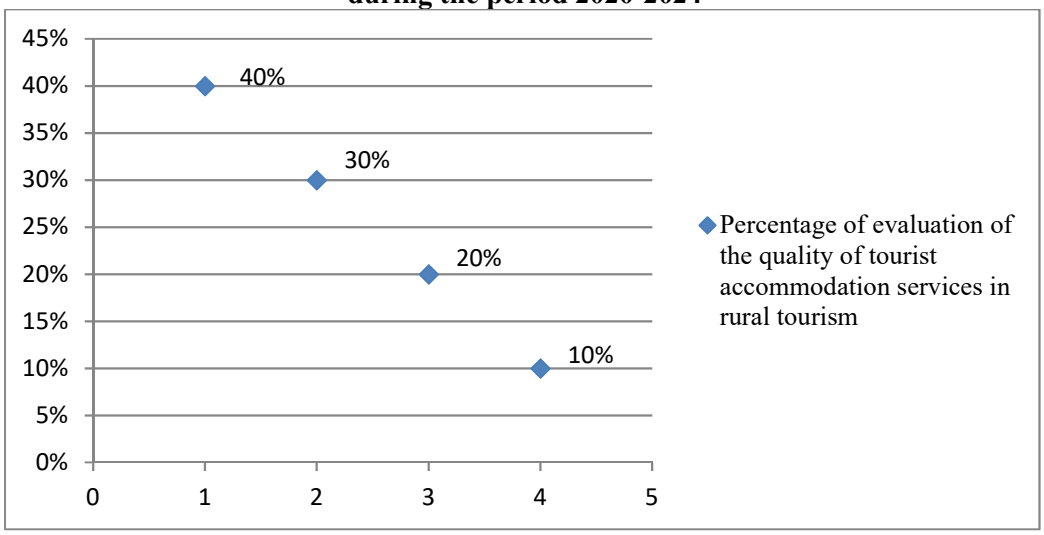
Following the results of the evaluations of ecotourism services, in the period 2020-2024, the author proposes a series of measures to improve the quality of ecotourism services in the Romanian rural area in order to attract more foreign tourists, with ecotourism accommodation conditions currently being evaluated as: 40% "Poor", 30% "Satisfactory", 20% "Good" and 10% "Very good".

Food services in ecotourism are quantified at a percentage of 78% with the qualification "Satisfactory", a result that highlights the lack of "Organic" ingredients in the preparation of menus for tourists present in ecotourism accommodation units.

The issue of developing the agrotourism and ecotourism fields by increasing the quality of the tourist services offered is debated worldwide. At a European level, ecotourism services are recording a continuous evolutionary trend. At a national level, mass tourism services are more sought after by Romanian tourists.

Among ecotourism transport services are: carriage transport services, horse riding services, cycle tourism services, these taking place in mountainous areas where rural tourism activities are carried out. In the counties of Covasna, Harghita, Brașov, Maramureș, ecotourism accommodation services have been developed intelligently through the national programs "SMART Tourism" and Start-Up Nation.

Figure no. 4. Evaluation of the quality of tourist accommodation services in rural tourism, during the period 2020-2024



Source: created by the author..

Compared to the level of quality of agrotourism accommodation services recorded in the period 2007-2016, a slow evolution of the level of quality of Romanian ecotourism services was observed, compared to the situation recorded in the European Union, in the period 2020-2024.

In this sense, the author proposed improving rural tourism services by improving accommodation services in accommodation units in rural communities where ecotourism economic activities are carried out.

The quality of ecotourism services is defined as the asset of success in terms of carrying out ecotourism activity in optimal conditions. At the same time, the maximum satisfaction of the ecotourist's need and the attempt to obtain zero defects of national tourism services. Diversification of ecotourism services is essential in European, national, regional and local tourism.

Orientation towards the needs of the tourist, in order to maximally satisfy tourist demand are strategic objectives in tourism management tactics. Increased attention is required from ecotourism service providers, and the orientation on the ecotourism product is dependent on the one mentioned above.

According to the data presented in previous research. the accommodation capacity in rural areas reaches the maximum quota of 5858656 places in agrotourism guesthouses, in 2021, which leads to an increase in rural and ecotourism tourism demand. Camping sites have almost tripled their number of places from 2019 to 2024, information that denotes an increased interest of the tourist in protecting nature, and at the same time, its valorization.

Conclusions

The social responsibility of ecotourism in the future involves adopting a new paradigm that encourages innovation, both for public administrations and for tourism businesses. Traditional tourism consumers get involved in agritourism every year, purchasing tourist services for accommodation, leisure, food and transport specific to ecotourism.

Branding strategies for tourist packages are the first step to be taken to achieve smart tourist objectives. Ecotourism labeling of such tourist packages implies, first of all, reputation in ecotourism and prestige in innovating sustainable and responsible ecotourism services. The effects of international green tourism are found in the turnover of each ecotourism accommodation unit in the country.

This form of rural tourism can be defined as *responsible tourism*, because it protects both the final consumer and the local community. Among the objectives of responsible tourism are the implementation and development of green tourism that leads to supporting *sustainable tourism*.

The lifestyle of buyers of ecotourism services has changed. Traditional mass media is increasingly ill-equipped to support the construction of a brand based on emotional and nationalistic coordinates in Romanian rural tourism. Product promotion is done by displaying tourist packages with the help of modern technology. The use of the internet and social networks have a major impact on tourist demand, as information circulates quickly over long distances and in different social environments.

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Analiza fenomenului de îmbătrânire a populației României

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Abstract

În cadrul acestui articol, am pornit de la considerentul că indicatorul privind populația rezidentă oferă informații prețioase, care sunt utilizate de către autoritățile publice și locale în adoptarea deciziilor bazate pe realitățile demografice și economice ale țării sau ale unei regiuni, care au impact economico-social. Astfel, în funcție de structura și dinamica populației rezidente se stabilesc politicile și strategiile referitoare la nivelul pensiilor publice, indemnizațiilor și ajutoarelor sociale, subvențiilor și altor tipuri de beneficii. De asemenea, un aspect important se referă la alocarea resurselor financiare în formarea bugetelor publice, astfel în funcție de numărul populației rezidente se stabilesc fondurile pentru sănătate, asistență socială și educație. Totodată, în funcție de evoluția acestui indicator se stabilesc strategiile demografice, autoritățile publice putând adopta măsuri în vederea încurajării natalității sau a migrației în anumite zone.

În cadrul acestui articol, am realizat o analiză a evoluției unor indicatori care caracterizează potențialul demografic din România, precum populația rezidentă, vârsta medie a a acesteia, raportul de dependență demografică sau ratei de dependență a persoanelor în vârstă, subliniind impactul creșterii speranței de viață și al accentuării fenomenului de îmbătrânire a populației asupra economiei naționale. În acest sens, am utilizat datele publicate de către Institutul Național de Statistică și Eurostat. Pentru evidențierea mai clară a datelor, am utilizat instrumentarul statistic, prin reprezentarea grafică și sub formă tabelară a acestora.

Cuvinte cheie: populația rezidentă, vârsta medie a populației, raportul de dependență demografică, structura demografică, îmbătrânirea populației

Clasificarea JEL: C10, J11, R23.

Introducere

Analiza structurii demografice este importantă pentru a înțelege tendințele populației și pentru a adopta deciziile de ordin economic, social și politic, determinând tipul de politici publice necesare, precum stimulente pentru natalitate sau migrație pentru a contracara îmbătrânirea populației. O populație îmbătrânită duce la scăderea forței de muncă și creșterea costurilor pentru sănătate, punând presiune pe sistemele de pensii și de sănătate. În schimb, o populație tânără și activă economic duce la creștere economică. De asemenea, vârsta populației influențează tipul de produse și servicii consumate, spre exemplu, o populație îmbătrânită crește cererea pentru servicii medicale.

Pentru măsurarea dimensiunii populației, în România se calculează doi indicatori și anume: populația rezidentă și populația după domiciliu, cele două tipuri de populații având sferă de cuprindere diferită. Astfel, populația rezidentă evidențiază totalitatea persoanelor cu cetățenie română, străină și fără cetățenie care au reședința obișnuită în România, pentru o perioadă de cel puțin 12 luni, în timp ce populația după domiciliu arată numărul persoanelor cu cetățenie română și domiciliu pe teritoriul României. Totodată, menționez faptul că, în populația rezidentă sunt incluse persoanele care au imigrat în România, dar sunt excluse persoanele care au emigrat din România.

Literature review

Andersen, Markussen și Røed (2021) au abordat o serie de aspecte referitoare la o reformă a sistemului de pensii din Norvegia și inegalitatea veniturilor pentru bătrânețe. Anghel (2021) a efectuat o analiză privind situația populației de vârsta a treia din România, cu accent pe perioada crizei sanitare,

cauzată de pandemia de coronavirus, din care a reieșit faptul că România se află departe de a se încadra în directivele europene, vizând nivelul mediu preconizat al veniturilor pensionarilor. Anghel, Radu și Bîrsan (2020) a realizat un studiu complex privind evoluția și structura populației după domiciliu din România.

Anghelache, Anghel și Ciobanu (2022) au evidențiat faptul că populaţia rezidentă din România a înregistrat trend îngrijorător de descreștere, care ar trebui să preocupe autoritățile publice. Anghelache et al (2021) au arătat că populaţia unei țări este element esențial pentru caracterizarea potenţialului economic.

Cooley și Henriksen (2018) au menționat că o posibilă explicație a creșterii economice mai lente poate fi dată de schimbarea demografică, respectiv îmbătrânirea populațiilor, combinată cu speranța de viață crescută. Cruz și Ahmed (2018) au considerat că schimbările demografice pot influența rezultatele economice și au analizat corelația dintre ponderea populației în vârstă de muncă cu creșterea economică pe cap de locuitor și rata sărăciei.

Hernæs, Markussen, Piggott și Røed (2024) au realizat o analiză prin care au arătat faptul că îmbunătățirea stimulentelor pentru muncă a determinat o creștere considerabilă a ratelor de angajare în detrimentul pensionării anticipate și al ieșirii prin asigurarea de invaliditate. Hummel și colaboratorii (2013) au considerat faptul că datele privind corelațiile dintre dinamica populației și durabilitate sunt relativ fragmentate și dispersate pe mai multe discipline, cuprinzând diverse teorii, paradigme și metodologii.

Ishika (2025) consideră că structura demografică afectează în mod substanțial dezvoltarea economică, modelând piețele muncii, tendințele consumatorilor și abordările investiționale, astfel că factorii de decizie trebuie să aibă o abordare prin care să valorifice potențialul indivizilor și să asigure consolidarea societăților pe fondul noilor realități demografice.

Liddle (2014) a arătat faptul că procesele demografice, cu precădere, populația, structura de vârstă, dimensiunea gospodăriei, urbanizarea și densitatea populației influențează emisiile de carbon și consumul de energie. Samways (2022) a astudiat corelația dintre creșterea populației și schimbările de mediu. Schmidthuber, Fechter, Schröder și Hess (2021) au abordat o serie de aspecte referitoare la politicile privind îmbătrânirea activă și amânarea pensionării.

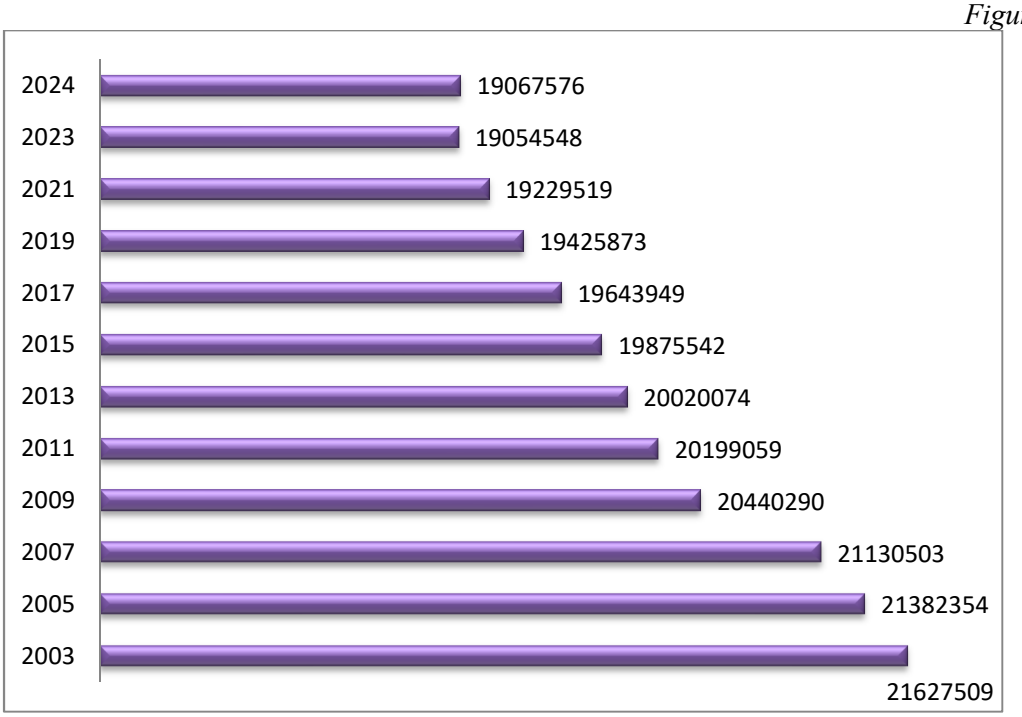
Waddell și colaboratorii (2025) au efectuat o analiză comparativă a mai multor abordări privind sprijinirea populației în vârstă, evidențiind faptul că unele modele nu sunt sensibile la diversitatea populației în vârstă, astfel au arătat necesitatea reconsiderării semnificației sintagmei îmbătrânirea în bune condiții.

Metodologia cercetării, date, rezultate şi discuţii

Pe baza datelor disponibile ale Institutului Național de Statistică, în figura nr. 1 este reprezentată grafic evoluția populaţiei rezidente a României, în perioada 2003-2024. În intervalul 2003-2023, se observă o tendință descendentă, fiind urmată de o ușoară creștere în anul 2024. Astfel, la 1 ianuarie 2024, în România, populația rezidentă a fost de 19.067.576 persoane, în creștere cu 13.028 persoane față de 1 ianuarie 2023.

Evoluția populației rezidente la 1 ianuarie în România, în perioada 2003-2024

Figura nr. 1



Sursa: reprezentarea autorului pe baza datelor Institutului Național de Statistică, tempo online, accesat în data de 02 martie 2025.

Proiecțiile demografice pentru România efectuate de către Eurostat arată o scădere semnificativă a populației în următoarele decenii. Astfel. estimările indică faptul că populația rezidentă a țării ar putea să scadă sub 16 milioane de persoane până în anul 2060, iar în anul 2100 ar putea fi puțin peste 14,5 milioane persoane.

Proiecțiile privind populația României în perioada 2030-2011 (persoane)

Tabelul nr. 1

Anul	Populația
2030	18.218.553
2040	17.232.578
2050	16.439.020
2060	15.689.153
2070	15.039.871
2080	14.681.481
2090	14.574.108
2100	14.609.506

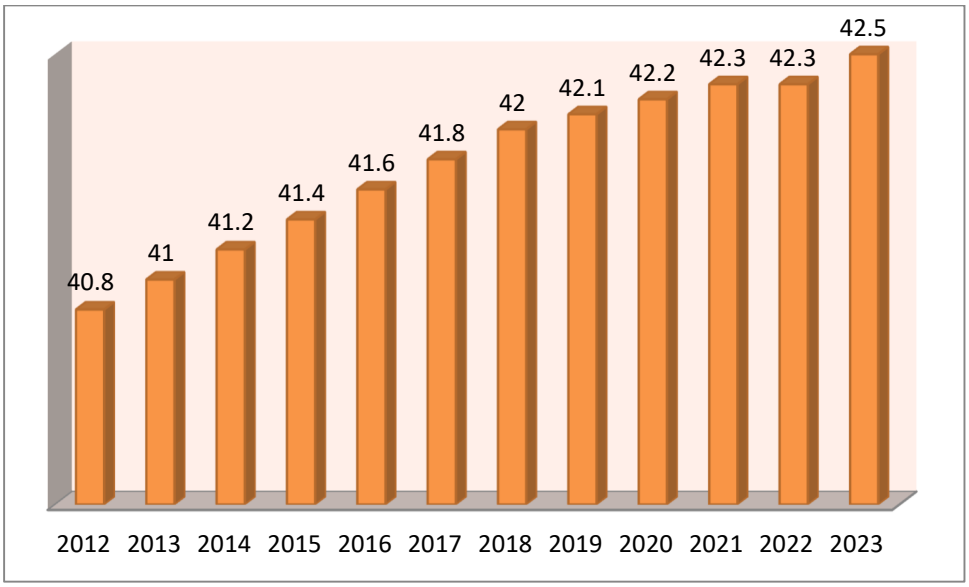
Sursa: Eurostat, accesat în data de 15 martie 2025; sistematizare proprie.

Aceste previziuni subliniază necesitatea implementării unor politici publice eficiente, în scopul contracarării declinului demografic și în vederea sprijinirii dezvoltării sustenabile a României în viitor.

Procesul de îmbătrânire demografică în România este reflectat și prin indicatorul referitor la vârsta medie a populației rezidente, care după cum se constată din tabelul de mai jos, acesta era de 42,5 ani, la 1 iulie 2023, în creștere cu 0,3 ani comparativ cu anul 2022. În întreg intervalul 2012-2023, vârsta medie a populației rezidente a crescut în continuu.

Vârsta medie a populației rezidente la 1 iulie (ani)

Figura nr. 2



Sursa: reprezentarea autorului pe baza datelor Institutului Național de Statistică, tempo online, accesat în data de 05 martie 2025.

În ultimii ani, în Europa se înregistrează un declin natural şi o îmbătrânire excesivă a populaţiei. Acest fenomen nu a ocolit nici România. Anul în care a avut loc schimbarea raportului dintre ponderea tinerilor şi cea a vârstnicilor, la nivelul Uniunii Europene este anul 2004, ponderea populaţiei de 65 ani şi peste (16,4%) depășind-o pe cea a populaţiei tinere sub 15 ani (16,2%). În România, schimbarea raportului dintre ponderea tinerilor şi cea a vârstnicilor a fost patru ani mai târziu, respectiv anul 2008[1].

În tabelul de mai jos sunt prezentate date cu privire la structura populației pe grupe de vârstă, în UE și România, în anii 2014, 2023 și 2024. Referitor la gruparea pe categorii de vârstă se impune precizarea conform căreia vârsta este exprimată în ani împliniți, respectiv o persoană care are vârsta de 24 ani și 11 luni este considerată ca având vârsta de 24 ani).

Structura populației pe grupe de vârstă, în UE și în statele menbre, în anii 2014, 2023 și 2024 (% din populația totală)

Tabelul nr. 2

Grupa de vârstă	Anul	UE	Romania
0–14 ani	2014	15,3	15,5
	2023	14,8	16,1
	2024	14,6	15,9
15–64 ani	2014	66	68
	2023	63,8	64,2
	2024	63,8	64,1
65 ani și peste	2014	18,7	16,5
	2023	21,3	19,7
	2024	21,6	20,0

Sursa: Eurostat, accesat în data de 15 martie 2025.

[1] Institutul Național de Statistică, Tendințe sociale, 2023

Structura pe grupe de vârste a populaţiei rezidente din România reflectă un proces de îmbătrânire a populaţiei, generat, cu precădere, de scăderea natalităţii, care a cauzat reducerea absolută şi relativă a populaţiei tinere (0-14 ani). Simultan, creşterea speranţei de viaţă a condus la majorarea numărului şi a ponderii populaţiei de 65 ani şi peste.

În perioada 2014-2024, în România, ponderea populației din grupa 15-64 ani, care reprezintă populația în vârstă de muncă a scăzut treptat, de la 68,0 în anul 2014 ajungând la 64,1% în anul 2024. În același timp, populația din grupa 65 de ani și peste a crescut semnificativ (de la 16,5 în anul 2014 la 20,0% în anul 2024).

În studiile referitoare la evoluția populației se analizează și indicele de îmbătrânire demografică a populației, care este numărul persoanelor vârstnice (de 65 ani şi peste) care revine la 100 de persoane tinere (sub 15 ani). Fenomenul de îmbătrânire demografică din România continuă să se accentueze, ecartul dintre populația vârstnică de 65 ani şi peste şi populația tânără de 0-14 ani menținându-se ridicat și fiind în creștere față de anul 2023. Astfel, față de anul 2023, s-a observat creșterea ponderii populației vârstnice (de 65 ani şi peste) de la 19,7% în anul 2023 la 20,0% în anul 2024, însemnând o creștere cu 0,3 puncte procentuale.

Totodată, ponderea populației din grupa 0-14 ani în total populație a scăzut de la 16,1% în anul 2023 la 15,9% în anul 2024. În aceste condiții, implicit, indicele de îmbătrânire demografică a înregistrat o creștere.

Populaţia rezidentă feminină este superioară numeric faţă de cea masculină (51,38%).

Populația rezidentă la 1 ianuarie 2024 pe grupe de vârstă și sex, în România (număr persoane)

Tabelul nr. 3

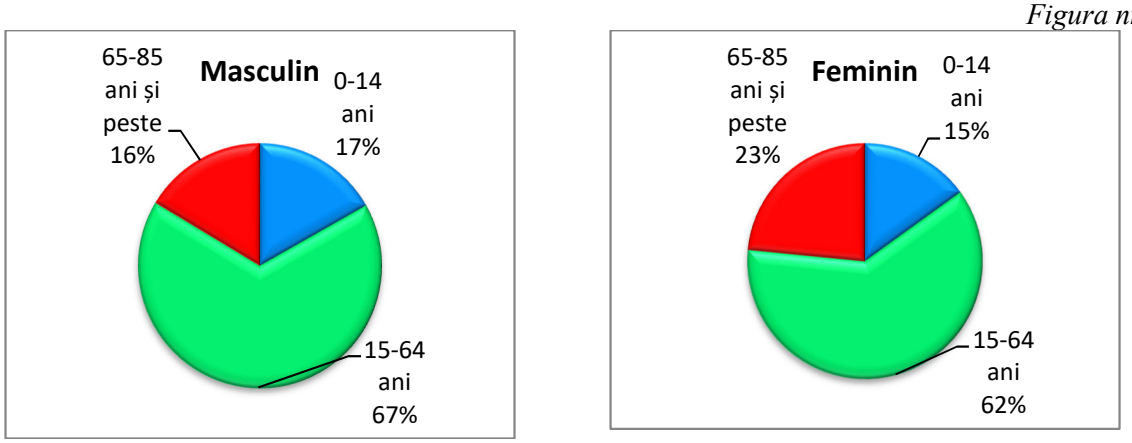
Grupe de vârstă	Masculin	Feminin	Total
0 - 14 ani	1.558.547	1.474.592	3.033.139
15- 64 ani	6.192.512	6.024.894	12.217.406
65 ani și peste	1.520.311	2.296.720	3.817.031
Total	9.271.370	9.796.206	19.067.576

Sursa: Institutul Național de Statistică, tempo online, accesat în data de 02 martie 2025.

La 1 ianuarie 2024, structura pe grupe de vârste a populaţiei rezidente a evidenţiat faptul că persoanele cuprinse în grupa de vârstă 15-64 de ani deţineau ponderea de 64,07% din totalul populaţiei.

Ponderea populației rezidente la 1 ianuarie 2024 pe grupe de vârstă și sex, în România (%)

Figura nr. 3



Sursa: reprezentarea autorului pe baza datelor Institutului Național de Statistică, tempo online, accesat în data de 02 martie 2025.

La 1 ianuarie 2024, populația rezidentă din mediul urban a fost de 9.896.535 persoane, în scădere față de anul precedent. Populația feminină a fost de 9.796.206 persoane, în scădere comparativ cu anul 2023. Datele cu privire la populația rezidentă la 1 ianuarie pe sexe și medii de rezidență în România, în anii 2023 și 2024 sunt cuprinse în tabelul de mai jos.

Populația rezidentă la 1 ianuarie pe sexe și medii de rezidență în România, în anii 2023 și 2024 (număr persoane)

Tabelul nr. 4

Gen	Medii de rezidență	2023	2024
Total	**Total**	19.054.548	19067576
-	**Urban**	9.940.887	9896535
-	**Rural**	9113661	9171041
Masculin	**Total**	9246151	9271370
-	**Urban**	4688305	4670077
-	**Rural**	4557846	4601293
Feminin	**Total**	9808397	9796206
-	**Urban**	5252582	5226458
-	**Rural**	4555815	4569748

Sursa: Institutul Național de Statistică, tempo online, accesat în data de 02 martie 2025.

La nivelul Uniunii Europene, potrivit estimărilor Eurostat, până în anul 2100, ponderea populației în vârstă de muncă va scădea în mod continuu, concomitent cu creșterea ponderii persoanelor în vârstă în totalul populației. Astfel, persoanele cu vârsta de 65 de ani și peste vor constitui 32,5% din populația UE până în 2100, față de 21,6% în anul 2024.

În ultimii ani, România se confruntă cu îmbătrânirea rapidă a populației, la 01 ianuarie 2024 înregistrând peste 3,8 milioane de persoane în vârstă de 65 de ani sau peste, însemnând 20,02% din populația rezidentă, spre deosebire de perioada 2003-2005, când ponderea era de aproximativ 14%. Totodată, se estimează că ponderea acestei categorii a populației va înregistra creșteri în continuare.

Populația rezidentă totală și populația rezidentă de 65 de ani și peste la 1 ianuarie pe grupe de vârstă, în perioada 2003-2024, în România (număr persoane)

Tabelul nr. 5

Anul	Total	65 de ani și peste*	% populație de 65 de ani și peste în total populație*
2003	21.627.509	3.053.118	14,12
2004	21.521.142	3.042.148	14,14
2005	21.382.354	3.026.156	14,15
2006	21.257.016	3.132.931	14,74
2007	21.130.503	3.110.437	14,72
2008	20.635.460	3.187.018	15,44
2009	20.440.290	3.299.478	16,14
2010	20.294.683	3.274.699	16,14
2011	20.199.059	3.256.361	16,12
2012	20.095.996	3.242.349	16,13
2013	20.020.074	3.258.198	16,27
2014	19.953.089	3.296.428	16,52

Anul	Total	65 de ani și peste*	% populație de 65 de ani și peste în total populație*
2015	19.875.542	3.374.954	16,98
2016	19.760.585	3.435.455	17,39
2017	19.643.949	3.494.137	17,79
2018	19.533.481	3.549.232	18,17
2019	19.425.873	3.595.481	18,51
2020	19.354.339	3.660.542	18,91
2021	19.229.519	3.703.136	19,26
2022	19.043.098	3.706.284	19,46
2023	19.054.548	3.755.746	19,71
2024	19.067.576	3.817.031	20,02

Sursa: Institutul Național de Statistică, tempo online, accesat în data de 15 februarie 2025; *calculele autorului.

Îmbătrânirea și creșterea speranței de viață sunt, de obicei, asociate cu perioade prelungite de fragilitate și de dependență. În România există o proporție semnificativă de persoane în vârstă, în special de peste 80 de ani, care necesită servicii de îngrijire pe termen lung.

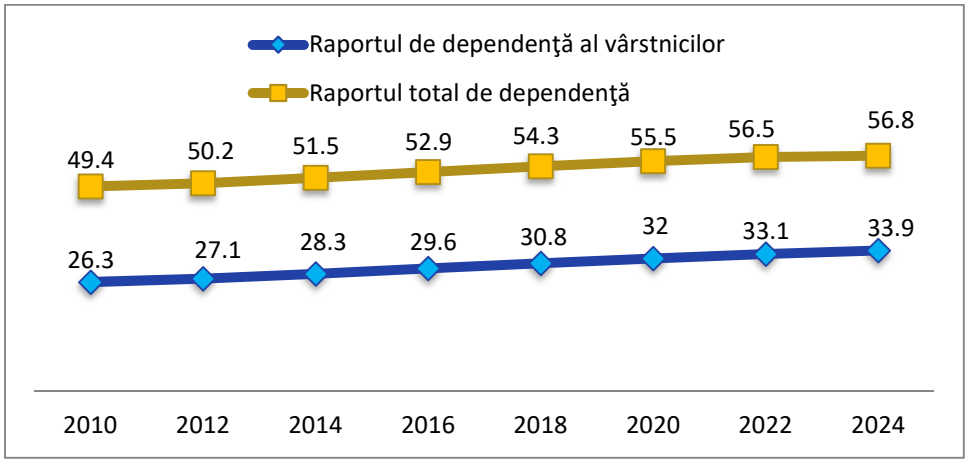
Un indicator important în stabilirea strategiilor economico-sociale ale unei țări este rata de dependență a persoanelor în vârstă**.** Această rată reprezintă raportul dintre numărul de persoane în vârstă de 65 de ani și peste (65 de ani este vârsta la care sunt în general persoanele sunt inactive din punct de vedere economic) și numărul de persoane cu vârsta cuprinsă între 15 și 64 de ani. Valoarea acestei rate este exprimată la 100 de persoane în vârstă de muncă (15-64).

Trebuie menționat faptul că asupra grupei de vârstă de 15-64 ani este exercitată presiune și din partea persoanelor dependente care au vârsta sub 15 ani. Astfel, se calculează raportul total de dependenţă, care este raportul dintre numărul persoanelor de vârstă „dependentă" (în acestă categorie sunt incluse persoanele sub 15 ani şi persoannele de peste 64 ani) şi populația în vârstă de muncă (15-64 ani) exprimat la 100 de persoane.

În figura următoare este evidențiată evoluția raportului total de dependenţă și raportului de dependenţă al vârstnicilor în Uniunea Europeană, în perioada 2010-2024.

Evoluția raportului total de dependenţă și raportului de dependenţă al vârstnicilor în Uniunea Europeană, în perioada 2010-2024 (%)

Figura nr. 4



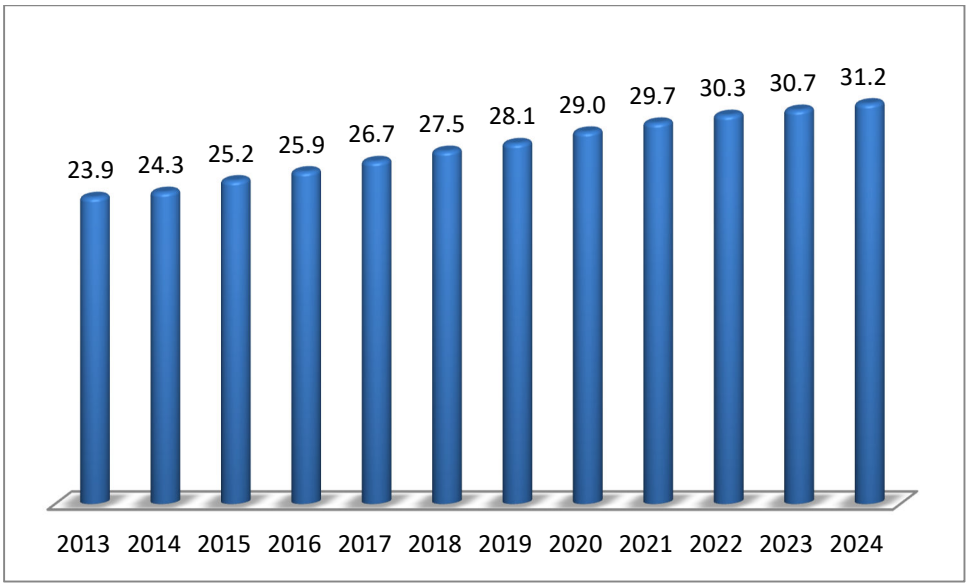
Sursa: reprezentarea autorului pe baza datelor Eurostat, accesat în data de 09 martie 2025.

În perioada 2010-2024, raportul total de dependenţă în Uniunea Europeană a crescut continuu, de la 49,4 la 56,8 persoane tinere și vârstnice la 100 persoane adulte. De asemenea, raportul de dependenţă al vârstnicilor a crescut de la 26,3%, în anul 2010 la 33,9%, în anul 2024.

O situație similară se înregistrează și în România, raportul de dependenţă al vârstnicilor crescând semnificativ în ultimii ani. Astfel, dacă în anul 2013, acest raport era de 23,9%, în anul 2024 a ajuns la 31,2% (Figura nr. 5). De obicei, raportul de dependenţă al vârstnicilor este mai mare în zonele rurale, însă, de-a lungul timpului, decalajul dintre zonele rurale și cele urbane s-a mai diminuat.

Evoluția raportului de dependenţă al vârstnicilor în România, în perioada 2013-2024 (%)

Figura nr. 5



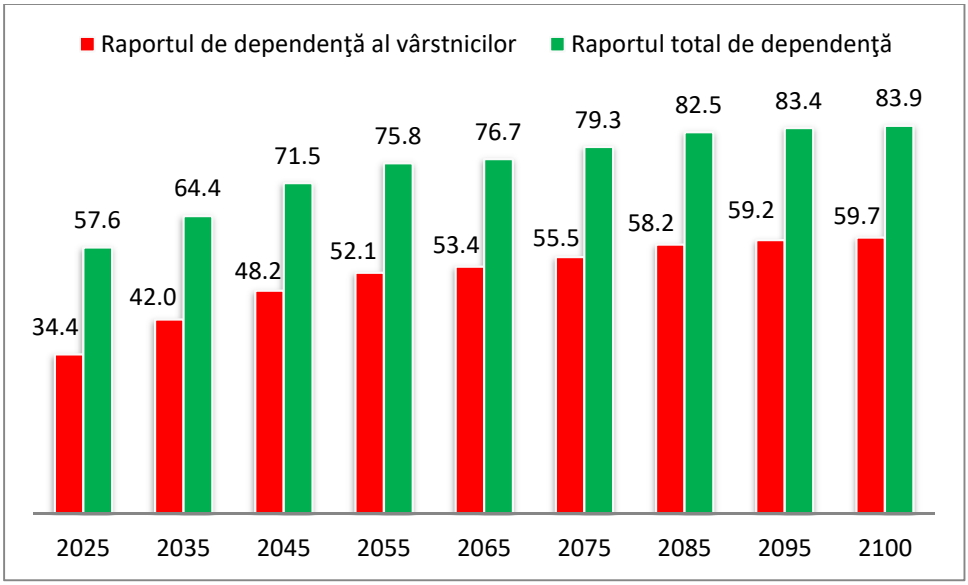
Sursa: reprezentarea autorului pe baza datelor Eurostat, accesat în data de 09 martie 2025.

Raportul de dependenţă al vârstnicilor din România este ridicat și se estimează că va continua să crească în continuare, din cauza îmbătrânirii populației și a scăderii natalității. Pentru a putea face față acestei situații, sunt necesare o serie de măsuri în domeniul economic, social și al politicilor publice, precum creșterea sustenabilității sistemului de pensii, prin încurajarea contribuțiilor la fondurile de pensii administrate privat și la fondurile de pensii facultative, introducerea unor facilități economice și fiscale pentru a atrage românii plecați la muncă în străinătate să revină în țară, creșterea atractivității pieței muncii din România, prin salarii competitive și condiții mai bune de lucru, pentru a determina românii să rămână în țară.

Totodată, pentru reducerea impactului negativ al creșterii raportului de dependență, ar putea fi implementate măsuri care să asigure o mai bună calitate a vieții pentru persoanele în vârstă, precum creșterea stimulentelor pentru continuarea activității profesionale după vârsta standard de pensionare sau sprijin pentru activități care încurajează îmbătrânirea activă (sport, voluntariat, cluburi pentru seniori), programe de educație pentru sănătate, prevenție și îngrijire medicală la vârste înaintate.

Proiecții privind evoluția raportului total de dependență și a raportului de dependență al vârstnicilor în Uniunea Europeană, în perioada 2025-2100 (%)

Figura nr. 6



Sursa: reprezentarea autorului pe baza datelor Eurostat, accesat în data de 09 martie 2025.

Se estimează că raportul de dependenţă al vârstnicilor din UE aproape se va dubla, ajungând la 59,7% până în 2100 de la 33,9%, în anul 2024. Acest fenomen se va înregistra ca rezultat al circulației populației între grupele de vârstă. De asemenea, raportul total de dependenţă va crește de la 56,8% în anul 2024 la 83,9% până în 2100. Mai multe date se regăsesc în reprezentarea grafică de mai sus.

Creșterea raportul de dependenţă al vârstnicilor exercită presiune asupra populației ocupate și a gestionării begetului public, împiedicând adesea creșterea economică. Totodată, scăderea ratei de dependență a tinerilor ar putea îmbunătăți incluziunea pe piața muncii, fiind potențial pentru creșterea producției economice.

Concluzii

În urma analizei efectuate în cadrul acestei cercetări se pot desprinde mai multe concluzii. Astfel procesul de îmbătrânire a populației României provoacă reducerea ratei de participare la forța de muncă, generând temeri în legătură cu încetinirea creșterii economice. Indicatorii statistici care caracterizează piața muncii, precum populația activă, populația ocuoată, șomajul sau locurile vacante reflectă stabilitatea sau dezechilibrele existente la nivel socio-economic.

În România, schimbările demografice vizează, în special, structura pe grupe de vârstă a populaţiei, creşterea ponderii populației de 65 de ani și peste ridicând probleme economice şi sociale deosebite. Concomitent cu creşterea speranței de viață, România se confruntă și cu rate scăzute de natalitate. În perioada 2014-2024, populaţia rezidentă de 0-14 ani a înregistrat un trend descrescător al ponderii în totalul populaţiei, reprezentând, în anul 2024, 15,9%, iar populația de 65 ani şi peste a înregistrat o creştere permanentă, ajungând la 20% în totalul populaţiei rezidente.

Fenomenul de îmbătrânire demografică este influențat de progresele obținute în ştiinţele medicale, dezvoltarea tehnologiei, precum și de îmbunătăţirea calităţii vieţii care au determinat creşterea speranţei de viaţă şi, automat, a creșterii ponderii persoanelor vârstnice în populaţia totală.

Potrivit estimărilor Eurostat, raportul de dependență al vârstnicilor din România va crește considerabil și în mod continuu, în mai puțin de 25 de ani (adică în anul 2050) va depăși 50%.

Pentru reducerea presiunii demografice asupra economiei naționale și asigurarea sustenabilității pe termen lung se impune adoptarea cât mai rapidă a unui set de măsuri. Printre acestea, o atenție sporită ar trebui îndreptată către creșterea ratei de ocupare a forței de muncă, spre exemplu, prin integrarea mai eficientă a tinerilor pe piața muncii, atractivitatea pieței muncii din România prin salarii competitive și condiții mai bune de lucru, crearea unui climat atractiv pentru întoarcerea în țară a românilor plecați în străinătate sau promovarea formării continue și recalificării pentru persoanele de peste 50 de ani. De asemenea, pentru reducerea presiunii pe bugetul public, ar trebui să se identifice variante alternative pentru diversificarea surselor de finanțare pentru sistemul de pensii, precum contribuțiile la fondurile de pensii private.

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ANALYSIS OF THE PHENOMENON OF ROMANIA'S POPULATION AGING

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Abstract

In this article, I started from the consideration that the indicator on the resident population provides valuable information, which is used by public and local authorities in adopting decisions based on the demographic and economic realities of the country or a region, which have an economic and social impact. Thus, depending on the structure and dynamics of the resident population, policies and strategies are established regarding the level of public pensions, social benefits and allowances, subsidies and other types of benefits. Also, an important aspect refers to the allocation of financial resources in the formation of public budgets, thus depending on the number of the resident population, funds for health, social assistance and education are established. At the same time, depending on the evolution of this indicator, demographic strategies are established, public authorities being able to adopt measures to encourage birth rates or migration in certain areas.

In this article, I have conducted an analysis of the evolution of some indicators that characterize the demographic potential of Romania, such as the resident population, its average age, the demographic dependency ratio or the elderly dependency rate, highlighting the impact of the increase in life expectancy and the accentuation of the population aging phenomenon on the national economy. In this regard, I have used data published by the National Institute of Statistics and Eurostat. In order to highlight the data more clearly, I have used statistical tools, through their graphical representation and in tabular form.

Keywords: resident population, average age of the population, demographic dependency ratio, demographic structure, population aging

JEL Classification: C10, J11, R23.

Introduction

The analysis of the demographic structure is important for understanding population trends and for adopting economic, social and political decisions, determining the type of public policies needed, such as birth or migration incentives to counteract population aging. An aging population leads to a decrease in the labor force and increased health costs, putting pressure on pension and health systems. In contrast, a young and economically active population leads to economic growth. The age of the population also influences the type of products and services consumed, for example, an aging population increases the demand for medical services.

To measure the size of the population, in Romania two indicators are calculated, namely: the resident population and the population by domicile, the two types of populations having different scopes. Thus, the resident population highlights all persons with Romanian citizenship, foreign and stateless persons who have their usual residence in Romania for a period of at least 12 months, while the population by domicile shows the number of persons with Romanian citizenship and domicile on the territory of Romania. At the same time, I mention that the resident population includes persons who have immigrated to Romania, but excludes persons who have emigrated from Romania.

Literature review

Andersen, Markussen and Røed (2021) addressed a number of issues related to a pension reform in Norway and the inequality of old age incomes. Anghel (2021) conducted an analysis of the situation of the elderly population in Romania, with a focus on the health crisis caused by the coronavirus

pandemic, which revealed that Romania is far from meeting the European directives regarding the expected average level of pensioner income. Anghel, Radu and Bîrsan (2020) conducted a comprehensive study on the evolution and structure of the population by residence in Romania.

Anghelache, Anghel and Ciobanu (2022) highlighted the fact that the resident population in Romania has registered a worrying trend of decrease, which should concern public authorities. Anghelache et al (2021) showed that a country's population is an essential element for characterizing its economic potential.

Cooley and Henriksen (2018) noted that a possible explanation for slower economic growth can be given by demographic change, namely aging populations, combined with increased life expectancy. Cruz and Ahmed (2018) considered that demographic changes can influence economic outcomes and analyzed the correlation between the share of the working-age population with economic growth per capita and the poverty rate.

Hernæs, Markussen, Piggott and Røed (2024) conducted an analysis in which they showed that improving work incentives led to a considerable increase in employment rates at the expense of early retirement and exit through disability insurance. Hummel et al. (2013) considered that the data on the correlations between population dynamics and sustainability are relatively fragmented and dispersed across several disciplines, encompassing various theories, paradigms and methodologies.

Ishika (2025) argues that demographic structure substantially affects economic development, shaping labor markets, consumer trends, and investment approaches, so policymakers must adopt an approach that harnesses the potential of individuals and strengthens societies in the face of new demographic realities.

Liddle (2014) has shown that demographic processes, particularly population, age structure, household size, urbanization, and population density, influence carbon emissions and energy consumption. Samways (2022) has studied the correlation between population growth and environmental change. Schmidthuber, Fechter, Schröder, and Hess (2021) have addressed a number of issues related to active aging and delayed retirement policies.

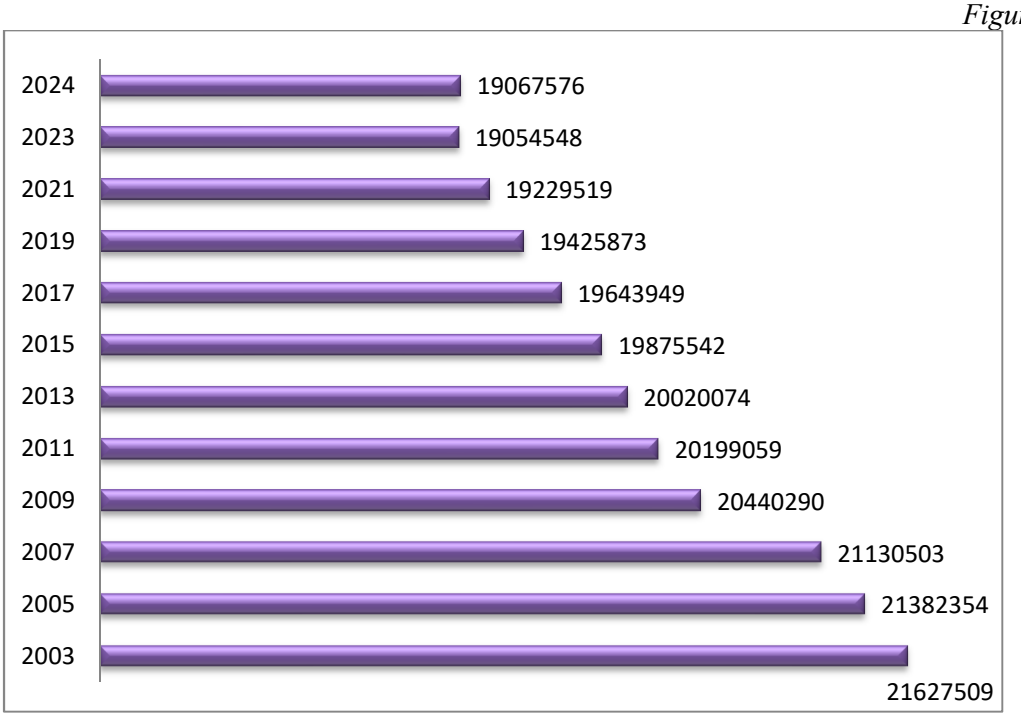
Waddell et al. (2025) conducted a comparative analysis of several approaches to supporting the elderly population, highlighting the fact that some models are not sensitive to the diversity of the elderly population, thus showing the need to reconsider the meaning of the phrase aging well.

Research methodology, data, results and discussions

Based on the available data of the National Institute of Statistics, figure no. 1 graphically represents the evolution of the resident population of Romania, during the period 2003-2024. In the period 2003-2023, a downward trend is observed, followed by a slight increase in 2024. Thus, on January 1, 2024, in Romania, the resident population was 19,067,576 people, an increase of 13,028 people compared to January 1, 2023.

Evolution of the resident population on January 1 in Romania, during the period 2003-2024

Figure no. 1



Source: author's representation based on data from the National Institute of Statistics, online tempo, accessed on March 2, 2025.

The demographic projections for Romania conducted by Eurostat show a significant population decline in the coming decades. Thus, estimates indicate that the country's resident population could fall below 16 million people by 2060, and in 2100 it could be just over 14.5 million people.

Projections regarding the Romania's population during the period 2030-2011 (persons)

Table no. 1

Year	Population
2030	18,218,553
2040	17,232,578
2050	16,439,020
2060	15,689,153
2070	15,039,871
2080	14,681,481
2090	14,574,108
2100	14,609,506

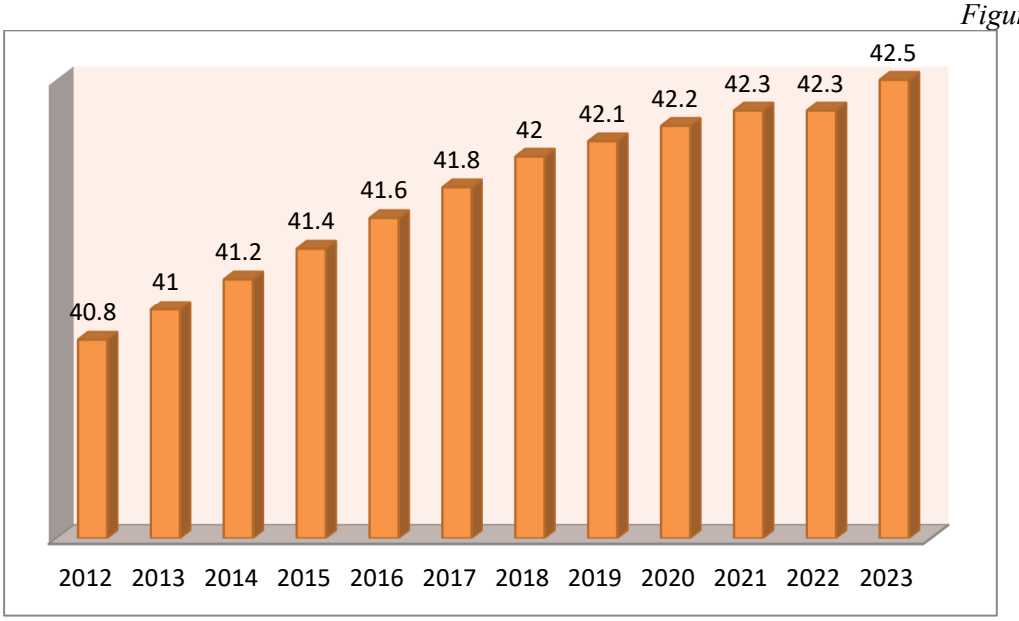
Source: Eurostat, accessed on March 15, 2025; own systematization.

These forecasts emphasize the need to implement effective public policies, in order to counteract demographic decline and support Romania's sustainable development in the future.

The demographic aging process in Romania is also reflected by the indicator relating to the average age of the resident population, which, as can be seen from the table below, was 42.5 years old, on July 1, 2023, an increase of 0.3 years compared to 2022. Throughout the 2012-2023 period, the average age of the resident population increased continuously.

Average age of the resident population on July 1 (years)

Figure no. 2



Source: author's representation based on data from the National Institute of Statistics, online tempo, accessed on March 5, 2025.

In recent years, Europe has been experiencing a natural decline and excessive population aging. This phenomenon has not bypassed Romania either. The year in which the ratio between the share of young people and that of the elderly took place, at the level of the European Union, was 2004, the share of the population aged 65 and over (16.4%) exceeding that of the young population under 15 (16.2%). In Romania, the change in the ratio between the share of young people and that of the elderly was four years later, namely in 2008.

The table below presents data on the population structure by age group, in the EU and Romania, in 2014, 2023 and 2024. Regarding the grouping by age category, it is necessary to specify that age is expressed in completed years, respectively a person who is 24 years and 11 months old is considered to be 24 years old.

Population structure by age group, in the EU and in the member states, in 2014, 2023 and 2024 (% of total population)

Table no. 2

Age group	Year	EU	Romania
0–14 years old	2014	15.3	15.5
	2023	14.8	16.1
	2024	14.6	15.9
15–64 years old	2014	66	68
	2023	63.8	64.2
	2024	63.8	64.1
65 years old or over	2014	18.7	16.5
	2023	21.3	19.7
	2024	21.6	20.0

Source: Eurostat, accessed on March 15, 2025.

The age structure of the resident population in Romania reflects a population aging process, generated mainly by the decrease in the birth rate, which caused the absolute and relative reduction of the young population (0-14 years). At the same time, the increase in life expectancy led to an increase in the number and share of the population aged 65 and over.

In the period 2014-2024, in Romania, the share of the population in the 15-64 age group, which represents the working-age population, gradually decreased, from 68.0 in 2014 to 64.1% in 2024. At the same time, the population in the 65 and over age group increased significantly (from 16.5 in 2014 to 20.0% in 2024).

The studies on population evolution also analyze the demographic aging index of the population, which is the number of elderly people (65 years and over) per 100 young people (under 15 years).

The phenomenon of demographic aging in Romania continues to increase, with the gap between the elderly population aged 65 and over and the young population aged 0-14 remaining high and increasing compared to 2023. Thus, compared to 2023, an increase in the share of the elderly population (65 years and over) was observed from 19.7% in 2023 to 20.0% in 2024, representing an increase of 0.3 percentage points.

At the same time, the share of the population in the 0-14 year group in the total population decreased from 16.1% in 2023 to 15.9% in 2024. Under these conditions, implicitly, the demographic aging index registered an increase. The female resident population is numerically superior to the male one (51.38%).

Resident population on January 1, 2024 by age and sex groups, in Romania (number of people)

Table no. 3

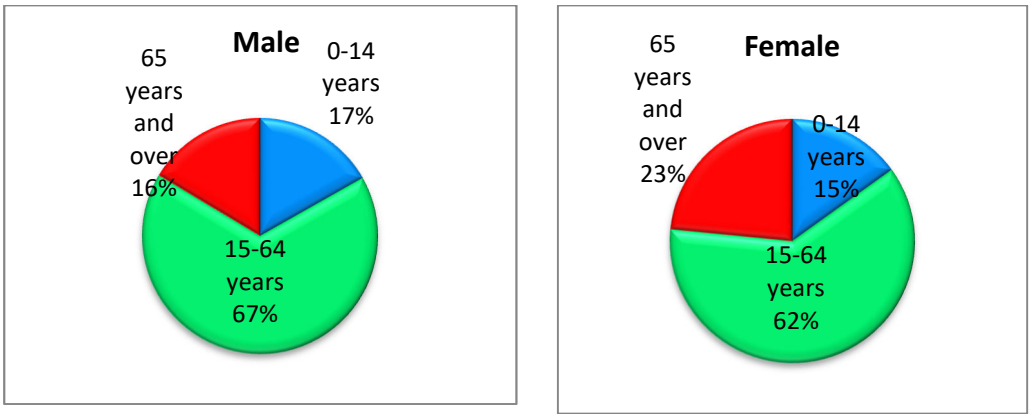
Age group	Male	Female	Total
0 - 14 years	1.558.547	1.474.592	3.033.139
15- 64 years	6.192.512	6.024.894	12.217.406
65 years and over	1.520.311	2.296.720	3.817.031
Total	9.271.370	9.796.206	19.067.576

Source: National Institute of Statistics, online tempo, accessed on March 2, 2025.

On January 1, 2024, the age group structure of the resident population highlighted the fact that people in the 15-64 age group accounted for 64.07% of the total population.

Share of the resident population on January 1, 2024 by age and sex groups, in Romania (%)

Figure no. 3



Source: author's representation based on data from the National Institute of Statistics, online tempo, accessed on March 2, 2025.

On January 1, 2024, the urban resident population was 9,896,535 people, down from the previous year. The female population was 9,796,206 people, down from 2023. Data on the resident population on January 1 by gender and area of residence in Romania, in 2023 and 2024 are included in the table below.

Resident population on January 1 by gender and area of residence in Romania, in 2023 and 2024 (number of people)

Table no. 4

Gender	Residence area	2023	2024
Total	**Total**	19,054,548	19,067,576
-	**Urban**	9,940,887	9,896,535
-	**Rural**	9,113,661	9,171,041
Male	**Total**	9,246,151	9,271,370
-	**Urban**	4,688,305	4,670,077
-	**Rural**	4,557,846	4,601,293
Female	**Total**	9,808,397	9,796,206
-	**Urban**	5,252,582	5,226,458
-	**Rural**	4,555,815	4,569,748

Source: National Institute of Statistics, online tempo, accessed on March 2, 2025.

At the European Union level, according to Eurostat estimates, by 2100, the share of the working-age population will continuously decrease, while the share of elderly people in the total population will increase. Thus, people aged 65 and over will constitute 32.5% of the EU population by 2100, compared to 21.6% in 2024. In recent years, Romania has been facing rapid population aging, with over 3.8 million people aged 65 or over on 1 January 2024, accounting for 20.02% of the resident population, compared to around 14% in 2003-2005. At the same time, it is estimated that the share of this category of the population will continue to increase.

Total resident population and resident population aged 65 and over on January 1 by age group, during 2003-2024, in Romania (number of persons)

Table no. 5

Year	Total	65 years and over*	% of the population aged 65 and over in the total population*
2003	21,627,509	3,053,118	14.12
2004	21,521,142	3,042,148	14.14
2005	21,382,354	3,026,156	14.15
2006	21,257,016	3,132,931	14.74
2007	21,130,503	3,110,437	14.72
2008	20,635,460	3,187,018	15.44
2009	20,440,290	3,299,478	16.14
2010	20,294,683	3,274,699	16.14
2011	20,199,059	3,256,361	16.12
2012	20,095,996	3,242,349	16.13
2013	20,020,074	3,258,198	16.27
2014	19,953,089	3,296,428	16.52
2015	19,875,542	3,374,954	16.98

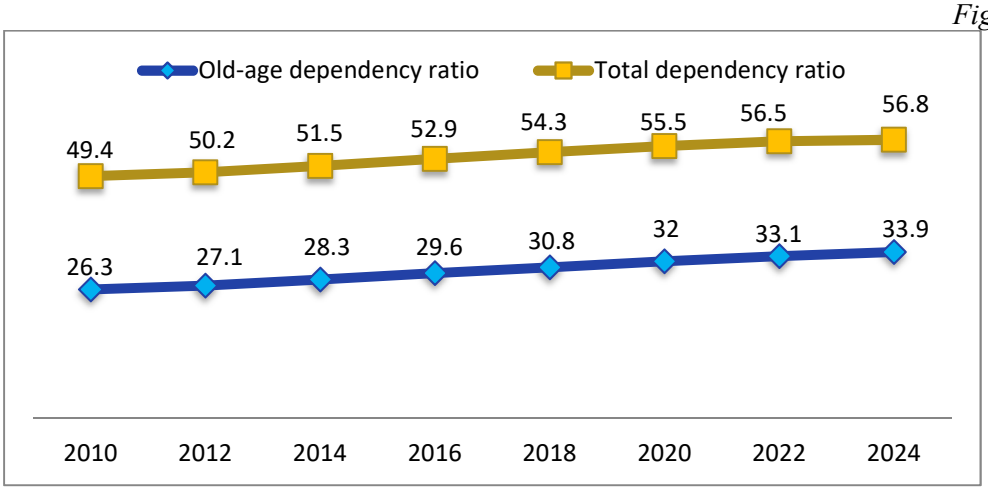
Year	Total	65 years and over*	% of the population aged 65 and over in the total population*
2016	19,760,585	3,435,455	17.39
2017	19,643,949	3,494,137	17.79
2018	19,533,481	3,549,232	18.17
2019	19,425,873	3,595,481	18.51
2020	19,354,339	3,660,542	18.91
2021	19,229,519	3,703,136	19.26
2022	19,043,098	3,706,284	19.46
2023	19,054,548	3,755,746	19.71
2024	19,067,576	3,817,031	20.02

*Source: National Institute of Statistics, online tempo, accessed on February 15, 2025; *author's calculations.*

Ageing and increased life expectancy are usually associated with prolonged periods of frailty and dependency. In Romania, there is a significant proportion of elderly people, especially those over 80, who require long-term care services. An important indicator in establishing a country's socio-economic strategies is the old-age dependency ratio. This ratio represents the ratio between the number of people aged 65 and over (65 is the age at which people are generally economically inactive) and the number of people aged 15 to 64. The value of this ratio is expressed per 100 people of working age (15-64). It should be noted that the 15-64 age group is also under pressure from dependent people under 15. Thus, the total dependency ratio is calculated, which is the ratio between the number of people of "dependent" age (this category includes people under 15 and people over 64) and the working-age population (15-64) expressed per 100 people. The following figure highlights the evolution of the total dependency ratio and the old-age dependency ratio in the European Union, during the period 2010-2024.

Evolution of the total dependency ratio and the old-age dependency ratio in the European Union, in the period 2010-2024 (%)

Figure no. 4



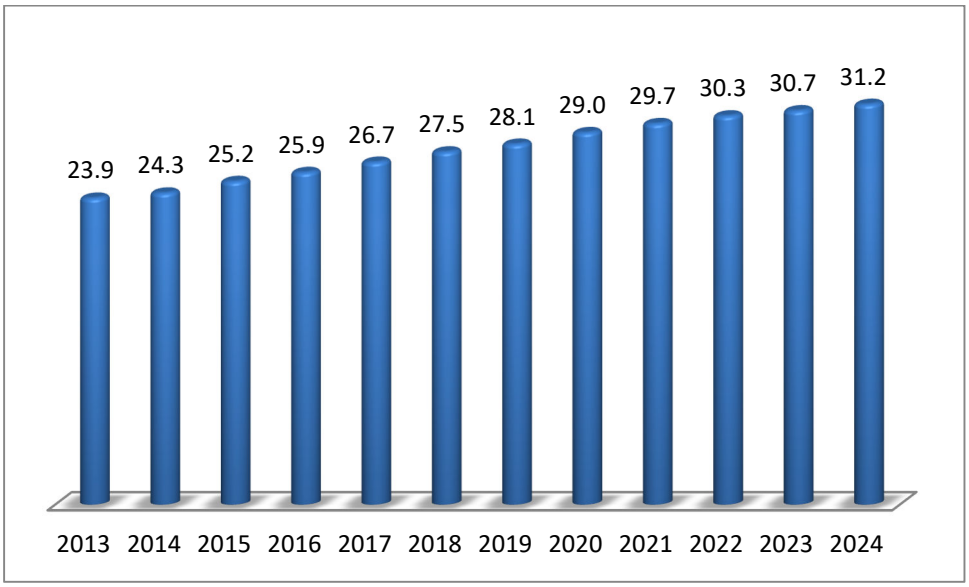
Source: author's representation based on Eurostat data, accessed on March 9, 2025.

During the period 2010-2024, the total dependency ratio in the European Union increased continuously, from 49.4 to 56.8 young and elderly people per 100 adult persons. Also, the dependency ratio of the elderly increased from 26.3% in 2010 to 33.9% in 2024. A similar situation is recorded in Romania, with the dependency ratio of the elderly increasing significantly in recent years. Thus, if in

2013, this ratio was 23.9%, in 2024 it reached 31.2% (Figure no. 5). Usually, the dependency ratio of the elderly is higher in rural areas, but, over time, the gap between rural and urban areas has diminished.

Evolution of the old-age dependency ratio in Romania, during the period 2013-2024 (%)

Figure no. 5



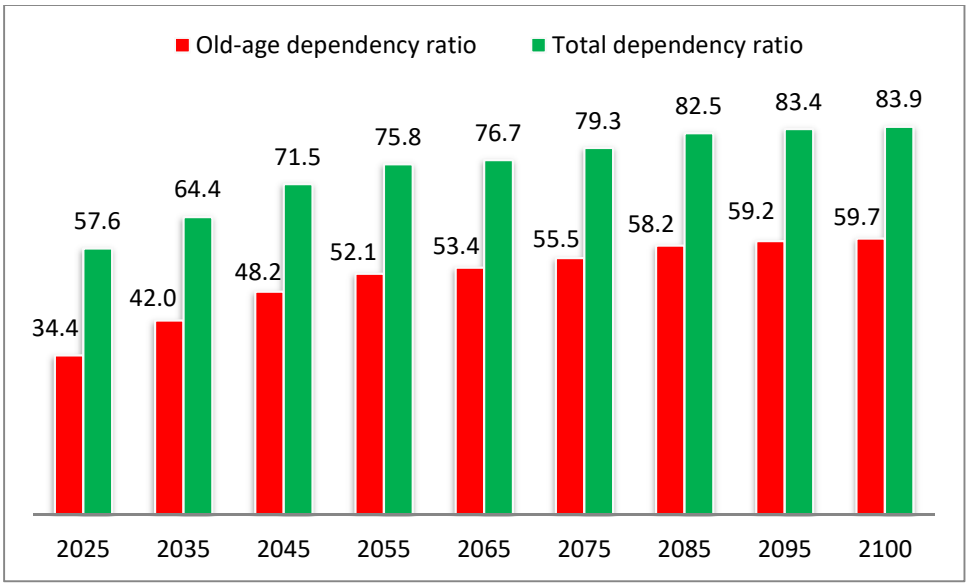
Source: author's representation based on Eurostat data, accessed on March 9, 2025.

The old-age dependency ratio in Romania is high and is expected to continue to increase, due to the aging of the population and the decline in the birth rate. In order to cope with this situation, a series of measures are needed in the economic, social and public policy fields, such as increasing the sustainability of the pension system, by encouraging contributions to privately managed pension funds and voluntary pension funds, introducing economic and fiscal facilities to attract Romanians who have gone abroad to work to return to the country, increasing the attractiveness of the Romanian labor market, through competitive salaries and better working conditions, to determine Romanians to stay in the country.

At the same time, to reduce the negative impact of the increase in the dependency ratio, measures could be implemented to ensure a better quality of life for older people, such as increasing incentives for continuing professional activity after the standard retirement age or support for activities that encourage active aging (sports, volunteering, senior clubs), health education programs, prevention and medical care at an advanced age.

Projections regarding the evolution of the total dependency ratio and the old-age dependency ratio in the European Union, during the period 2025-2100 (%)

Figure no. 6



Source: author's representation based on Eurostat data, accessed on March 9, 2025.

The EU's old-age dependency ratio is projected to almost double to 59.7% by 2100, from 33.9% in 2024. This will be driven by population movement between age groups. The overall dependency ratio will also increase from 56.8% in 2024 to 83.9% by 2100. More data can be found in the chart above.

The rising old-age dependency ratio puts pressure on the employed population and public spending, often hindering economic growth. At the same time, reducing the youth dependency ratio could improve labour market inclusion, potentially boosting economic output.

Conclusions

Following the analysis carried out in this research, several conclusions can be drawn. Thus, the aging process of the Romanian population causes a reduction in the labor force participation rate, generating fears about the slowdown in economic growth. Statistical indicators that characterize the labor market, such as the active population, the employed population, unemployment or vacancies reflect the stability or imbalances existing at the socio-economic level.

In Romania, demographic changes target, in particular, the age structure of the population, the increase in the share of the population aged 65 and over, raising particular economic and social problems. Simultaneously with the increase in life expectancy, Romania is also faced with low birth rates. During the period 2014-2024, the resident population aged 0-14 registered a decreasing trend in the share of the total population, representing, in 2024, 15.9%, and the population aged 65 and over registered a permanent increase, reaching 20% of the total resident population.

The phenomenon of demographic aging is influenced by the progress achieved in medical sciences, the development of technology, as well as the improvement of the quality of life that have determined the increase in life expectancy and, automatically, the increase in the share of elderly people in the total population.

According to Eurostat estimates, the dependency ratio of the elderly in Romania will increase considerably and continuously, in less than 25 years (i.e. in 2050) it will exceed 50%.

In order to reduce the demographic pressure on the national economy and ensure long-term sustainability, it is necessary to adopt a set of measures as soon as possible. Among these, increased

attention should be directed towards increasing the employment rate, for example, through more efficient integration of young people into the labor market, the attractiveness of the Romanian labor market through competitive salaries and better working conditions, creating an attractive climate for the return of Romanians abroad, or promoting continuous training and retraining for people over 50. Also, to reduce the pressure on the public budget, alternative options should be identified to diversify the sources of financing for the pension system, such as contributions to private pension funds.

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MAKING MANAGEMENT DECISIONS ON THE DEVELOPMENT OF THE TOURISM INDUSTRY IN THE CONTEXT OF DIGITALIZATION

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Abstract

Formulation of the problem. This article discusses the principles of making management decisions in the tourism business. The key factors that influence the final decision are analyzed and systematized. Currently, the tourism business is undergoing significant changes. This is due, first of all, to the influence of challenges dictated by economic, political and, most importantly, biological factors. Experts predict a number of changes and transformations for the tourism business, which in the coming years can seriously change the structure of the global tourism market. Digital solutions are considered as a factor that has a significant impact on the transformation of the tourism industry at present, and in the future, as experts predict, its influence will only increase. Digital services are called one of the most promising tools for the sustainable development of the tourism sector and the comprehensive promotion of tourism products. It is predicted that digital solutions will accompany tourists at all stages - from vacation planning to exchanging impressions after its completion. At the same time, despite a significant number of scientific studies devoted to digitalization, issues of digital support of business processes in the tourism sector are insufficiently covered in scientific circles. This is due to the high level of uncertainty in the tourism market, the rapid pace of development of innovative digital technologies and the impossibility of ensuring a high level of forecast reliability.

The purpose of the study. The hospitality and tourism industry currently includes many services, which in turn requires the use of digital technologies. Currently, digital systems are considered as a strategic resource for the development of entrepreneurial activity. This is especially important in the tourism and hospitality industry, where the activity is the most information-rich. Digitalization in tourism introduces modern digital technologies into business, improving existing processes. The purpose of the study is to identify new opportunities for the development of tourism and hospitality services in the context of digital transformation, identify problems and trends in the digitalization of the hotel and tourism business.

The object of the study. The object of the study is the benefits of using digital transformations in increasing innovation activity and efficiency in the tourism and hospitality services sector.

Research methods. In the process of writing the article, the works of foreign and domestic authors, as well as electronic resources, were used. The following methods of scientific knowledge were used to write the article: synthesis, comparison, generalization, content analysis of scientific works and electronic resources.

The main hypothesis of the follow-up.. Digital transformation has allowed hotels to implement databases that keep track of all ongoing processes, accumulating information about clients. The emergence of aggregators, services that allow you to book accommodation in any hotel in the world, has dramatically simplified the process of reserving hotel rooms. Today, it has become possible to

consider offers from different tour operators, airlines and other suppliers of tourist services on one digital platform. In our modern world, technology plays an important key role in improving and promoting tourism and hotel products.

Present of the main material. Modern conditions dictate new requirements for digitalization of various sectors of the economy, including tourism. This is due to the fact that digitalization as a process of using digital resources in the activities of an organization to improve the work of the enterprise, radically changes approaches to business processes. Today, in the context of actively developing information and digital technologies, it is impossible to name any industry that would not be affected by these changes. If we talk about the tourism industry - about tourism, hotel, restaurant services, about the activities of travel agencies and tour operators, then we can safely say that these areas have long stepped towards digitalization. The hospitality and tourism industry currently includes many services, which in turn requires the use of digital technologies.

Conclusions and prospects for further research. In digital transformation, it is important to understand the essence and technologies of digitalization, clearly set goals, look at the scale of the entire business: use analytics, set performance indicators, eliminate losses in business processes and remove system limitations. These are important conditions for the successful implementation of digital and business transformation. The role of digital transformation in the tourism industry is obvious. Thanks to the digitalization of the tourism services sector, vacations in hotels become more comfortable, safe, and of higher quality; purchasing tours quickly, satisfying the needs of the client; visiting tourist sites information-rich. Digital transformation takes the industry to a completely different level of development and it is important not to stop in this process.

Keywords: management decision; methods of developing; management decisions tourism; tourist; mountain tourism; mountains; landscape.

JEL Classification: R11, Z32.

Introduction

Formulation of the problem. The tourism sector throughout the world is increasingly becoming a key indicator of socio-economic development of both regions and individual municipalities, exerting a significant influence on key sectors of the economy: transport, trade, communications, construction, agriculture, and production of consumer goods. Tourism development ensures an influx of investment and funds into budgets at all levels, the creation of jobs, the development of infrastructure, the improvement of public health, the preservation and rational use of cultural, historical and natural heritage, the stimulation of the development of local industry, and the increased interest of the local population and the younger generation in the culture and history of the tourist region (center). A management decision is a natural result of the manager's activities and is implemented in the form of a directive, targeted impact on the management object. "A management decision is an act of purposeful change in a situation, problem resolution, an option for influencing a system and the processes occurring in it. Management decisions involve management actions that lead to the resolution of a contradiction and a change in the situation." Methods for developing management decisions are the ways and means of performing the operations required in the process of making them. These include methods of analysis, processing information, choosing options for action, etc. Developing management decisions in tourism organizations has certain specifics. The art of communication and acting on the situation are especially in demand here. Tourism organizations will experience an acute shortage of workers, qualified specialists in the field of tourism management and hotel business. Concluding an agreement with a well-known tour operator, preparing a package of documents for a tourist, purchasing furniture and equipment, sending employees on a familiarization tour, increasing advertising costs, creating your own website - all these are examples of making management decisions in tourism. This area of activity requires special knowledge and skills from managers. Requirements for the professional competence of managers in the field of tourism include:

1) Knowledge of the technology of selling a tourist product.
2) Business communication skills and knowledge of customer psychology.
3) Knowledge of the basics of regional studies and the main areas of tourism.
4) Ability to work with documents and databases.
5) Knowledge of the legal basis for tourism.
6) Free command of Internet technologies, skills in sales and online booking.
7) Use of positive behavior models.

Many factors influencing tourism demand have formed a new socio-cultural phenomenon – the "smart tourist", for whom digital communications have become the main attribute of a quality vacation. The smart tourist is characterized by new behavioral habits (moving away from mass and passive tourism), new consumption models (using intelligent platforms aimed at developing tourist experiences), new business models (personalized services to meet specific needs) and a close connection with digital technologies and sustainable development. The smart tourist carefully prepares for the upcoming trip and its organization, carefully selects the tour and its components, and often organizes the trip independently. To do this, he uses multiple services and sites, reads articles and reviews, studies the possibilities of tourist destinations, including digital ones. Analysis of Google search queries shows that on average, one user makes about 400 queries when planning a trip. At the present stage, more than 75% of travelers prepare their trips using online services, such as: booking hotel services Booking.com, renting out housing AirBnB, cheap flights, hotels and car rental SkyScanner, online booking of airline tickets AviaSales, the community of independent travelers CouchSurfing, etc. The smart tourism direction combines tourism planning in the territory, the application of sustainability principles to the value chain, the introduction of digital technologies in tourist impressions and the provision of services, effective resource management and the ability to respond to the needs and behavior of tourists. With the help of digital channels, smart tourism creates an innovative space accessible to everyone, simplifies the interaction and integration of the environment and the guest, improves the quality of services and at the same time preserves tourist attractions with the help of balanced decisions on traffic and demand forecasting, i.e. it contributes to the sustainable development of the tourist territory with the help of digital technologies.

Literature review

Our analysis of scientific publications on the topic of the study allows us to note that the digital transformation taking place in modern society is reflected in the field of tourism and hospitality. The works of domestic and foreign scientists are devoted to the study of digital technologies and innovative processes in the field of hospitality and tourism. The following scientists were engaged in these issues: Bogolyubova V.S., Makrinova E.I., Sotnik A.P., Khaidarova I.S., Sobolevskoy T.G., Khamirzova S.K., Kumpilova A.R., Kalashnikova S.V., Khachemizova E.A. and others. Despite the large number of studies on this scientific topic, the issue of using digital communications in the tourism and hospitality industry and their impact on the economic growth of enterprises in this industry remains open.

In addition, the scheme of economic relations between all participants in the tourism market is fundamentally changing in the context of digitalization, including between government agencies regulating tourism activities, between producers and consumers of tourism and hotel services. Thus, the process of developing a new economic business model for the hospitality and tourism industry in the form of an ecosystem seems particularly relevant. Thus, the key driver of changes in the new era are digital technologies that stimulate accelerated innovative development of the economy, management and society, thereby influencing almost all spheres of society.

Methodology, data, results and discussions

The purpose of the article. Digital transformation has brought the tourism sector to high positions in the use of modern information and communication technologies. Among the leaders of digital

transformation, the tourism sector stands out not only for its wide application of digital technologies in management, marketing, implementation of many business functions and production operations, but also for increasing the activity and interest of potential consumers and tourists in independent travel planning and their direct implementation in all the variety of constituent elements (development of travel routes and selection of attractive places to visit, booking of transport tickets and accommodation facilities, insurance services, entertainment, etc.). At the same time, the process of digital transformation is uneven: large organizations and enterprises of tourist intermediaries and the hotel industry, located in cities and industrially developed regions, are joining it more quickly. For small and medium-sized businesses, this process is constrained by high costs, difficulties in hardware and software, and a shortage of qualified personnel.

The purpose of this study is to reveal the features of the formation of digital tourism in general and outline measures to support its further development. To achieve this goal, the following tasks were solved: the evolution of approaches to defining the concepts of "e-tourism", "smart tourism", "digital tourism" was shown. The main areas of using digital technologies in the tourism sector were characterized; the features of the formation of new models of entrepreneurial activity of tourist intermediaries were revealed. The regional and industry aspect of the development of digital tourism and the forms of its support were analyzed. Research methodology The rapid development of tourism, its high significance in the modern standard of living of people, the intensification of relevant types of entrepreneurial activity attract the attention of both practitioners and scientific researchers. This led to the formation of various methodological approaches to the study, as well as to the emergence of various terms and their ambiguous interpretation. The spread of such terms as "e-tourism", "smart tourism", "digital tourism" in Russian and English occurred due to the penetration of information and communication technologies into the tourism sector. Electronic tourism (e-tourism), or online tourism, as a term reflects primarily the use of the Internet in the management and marketing of tourism products and services for more complete interaction with the consumer. At the same time, online tourism is also associated with virtual tours, virtual walks, online travel, for which various Internet resources are used (travel agency websites, travel blogs on social networks, travel TV channels, etc.).

Management decisions made in a tour operator organization:

1) Conclusion of contracts with regional representatives; 2) Provision of material support for the organization,

3) Carrying out advertising campaigns and promotions;

4) Concluding contracts with individual clients;

5) Developing new areas of tourism activity;

6) Entering new markets;

7) Concluding contracts with foreign partners;

8) Creating a reserve fund;

9) Creating an electronic sales system and improving it;

10) Creating conditions to ensure the safety of tourists, etc.

Management decisions made in a travel agency organization:

1) Concluding contracts with tour operators, owners of famous brands,

2) Registration of a package of documents for a tourist;

3) Provision of material support for the company, decoration of premises and supply of office equipment;

4) Sending employees for training;

5) Creating a website for the organization and promoting it to the market;

6) Using an electronic booking system;

7) Organizing an effective system of working with clients (by phone and in person);

8) Solving unforeseen situations and problems.

A manager in the tourism business spends most of his time on communications and interaction with the consumer, so special attention should be paid to the creation of an adequate corporate culture with a high management context. Culture is a set of traditions, norms, values, meanings, ideas, and sign systems characteristic of a social community.

The culture of tourism organizations is characterized by a pronounced focus on consumer needs and includes:

1) A special culture of communication with clients (understanding, information content, decency)

2) Traditions and atmosphere of travel and vacation

3) Group norms of joint, conflict-free, effective activity

4) Philosophy of satisfying comprehensive customer needs

5) Favorable socio-psychological climate

6) Skillful operational skills in working with office equipment and databases

7) Basic metaphors embodied in the office design, interior design, aimed at potential tourists (comfortable furniture; modern office equipment; souvenirs reminiscent of travel; brochures and magazines informing about vacation destinations, etc.)

8) Openness to the world and other cultures.

The social aspects of making management decisions in the tourism business can be characterized as follows.

1) High demands are placed on the competence of managers, their growth in initiative and responsibility

2) The role of communications increases, feedback from consumers is necessary

3) The behavioral characteristics of managers and the organizational culture are characterized by a focus on consumers

4) A democratic management style, conflict-free and joint problem solving prevails

5) HR methods are focused on continuous training and development of personnel

6) Achieving efficiency is possible provided that a special organizational culture is created

So, the development of management solutions in tourism is an initiative, creative work, an innovative approach to work, goodwill and activity according to the situation.

Presentation of the main research results

"Smart tourism" ("smart tourism") as a term is used to describe the interaction of modern information technologies and sustainable development of the tourism industry, is interpreted as a type of tourism using smart technologies to create additional travel value for tourists. "Smart tourism" involves the convergence of technologies and tourist experience, leading to a more complete satisfaction of the needs and expectations of new youth types of tourists. In the process of its formation, "smart tourism" has absorbed elements of e-tourism, which developed on the basis of innovations, the introduction of information technologies that led to the creation of global centralized booking systems, social networks, and mobile technologies.

"Smart tourism" includes several components:

- firstly, intelligent technologies associated with the principles of a "smart city", taking into account the needs of both residents and tourists in supporting the availability and mobility of resources for a certain quality of life;
- secondly, a social phenomenon based on the personalized intellectual experience of tourists; a complex business ecosystem, including public-private partnerships, combining the exchange of tourism resources and the widespread creation of tourism experiences.

The Chinese experience in developing “smart tourism” shows that this is a long-term process of long-term planning and implementation, combined with the development of “smart cities” projects.

Since 2019, the European Commission, in order to promote “smart” and sustainable tourism practices, has been competitively selecting a European Capital and a European “Green Pioneer” of

"smart tourism" as tourism destinations in four categories: sustainability, accessibility, digitalization, cultural heritage and creativity. In 2023, these capitals are Paphos in Cyprus and Seville in Spain.

"Smart tourism" is defined as tourism supported by integrated efforts at the destination to collect and aggregate/use data obtained from physical infrastructure, social media, government/organizational sources and human bodies/minds, combined with the use of advanced technologies. Subsequently, this data is transformed into operational information and value propositions for businesses focused on efficiency and sustainability.

Further advancement of digital transformation has led to new forms of communication between producers of tourism products and services, which has led to the emergence of digital tourism. Since digital tourism is a new concept that has not yet received a specific generally accepted definition, it is considered as a stage of digital transformation, during which the attraction of people as active users of modern information and communication technologies in the sphere of real tourism is increased. This is due to the fact that digital technologies in the Russian tourism sector currently perform limited functions. Nevertheless, world experience shows an increase in the efficiency of tourism management using digital technologies. The Tourism Development Strategy provides for a set of measures to introduce digital technologies in the tourism sector, including the use of digital solutions made on the basis of interaction between state information systems and the business and expert community during the development and implementation of projects, the formation of a tourism ecosystem to ensure the best customer experience for all market participants on an online platform integrated with external sources and social platforms, as well as the creation of various services and mobile applications for the promotion of tourism products. Digital tourism is aimed at using digital technologies and online tools to manage the tourism sector, create, promote and sell tourism products, attract consumers and provide them with access to the necessary information for planning trips and booking services. The process of continuous improvement of digital technologies in tourism is forming a relatively new Travel Tech industry that improves travel opportunities, since it "allows you to seamlessly plan a trip online using platforms and applications for booking full-fledged tours or accommodation and tickets separately," which generally improves the perception and experience of tourists and increases the efficiency of entrepreneurial activity. At the same time, the development of digital tourism requires increased attention to the issues of data security, financial payments, and Internet accessibility in remote areas.

Digital technologies are constantly evolving and improving, which contributes to the expansion of their application in the tourism industry (Table 1). Artificial intelligence creates conditions for travel personalization, as opportunities for a more representative consumer choice appear while saving time on searching for the desired tourist product, route or service. With the help of artificial intelligence technologies, tourists can find out about the dates of the most advantageous purchase of tickets, about the conditions for booking accommodation. Facial recognition technologies simplify check-in for a flight. Using mobile applications, it is convenient to plan trips, simultaneously issuing and paying for tickets, hotel reservations, insurance, transfers, excursions, etc. The use of voice support when booking hotels, car rentals and other services is gaining popularity. Chatbot allows you to receive consultations in real time 24/7.

Virtual reality technology reveals the features of a tourist route, demonstrating the most interesting sights. Using Internet of Things technology, you can remotely control the unlocking of a rented car and control the movement of luggage. Big data serves as the basis for business analytics built on information about electronic commercial transactions, recommendations are developed, and management decisions are made to improve customer service, promote the brand and specific products, find ways to increase the efficiency of the company, develop infrastructure, and form tourist clusters. Possible consolidation of big data in the ecosystem of Russian domestic and inbound tourism will allow raising the forecasting of the scale and directions of tourist flows to a higher level, which will significantly affect the development of the tourism sector.

Most tourists begin to plan their trip in advance, in some cases focusing on new attractions and routes. At the same time, they would like to understand in advance what impressions they can get, what level of comfort certain features of the trip create, which can be preliminarily assessed with the help of virtual tours, storytelling, information from social networks, advertising videos. Presentations of hotels, hotel rooms, restaurants, attractions, created on the basis of virtual reality technology, can provide such a complete understanding of the features of the upcoming trip, making the consumer choice reliable and justified.

Directions for the use of digital technologies in the tourism sector

Table no. 1

Technologies	Travel agents	Hotel industry
Artificial intelligence	□ Travel personalization; □ booking improvement; □ business analytics; □ service price forecasting; □ dynamic pricing; □ finding the best deals for tourists; □ using mobile applications; □ tagging luggage to track its location; □ 24/7 tourist support through virtual assistants; □ data privacy and payment security; □ optimization of functional processes, which will reduce the workload of employees; □ pattern recognition and behavioral analysis to prevent fraud; □ optimization of transport and logistics operations.	□ Guest data analytics; □ consumer demand forecasting; □ booking improvement; □ conversion for each request; □ optimal pricing; □ using loyalty programs; □ using chatbots on social media platforms; □ using mobile applications; □ smart home systems; □ robot assistants; □ marketing and promotion of services; □ advertising technologies; □ RMS systems (remote administration)
Big data analysis	□ Study of the tourist potential of the region; □ Analysis of tourist flow; □ Geoanalytics; □ Selection of sources of initial data; □ Forecasting and assessment of target markets; □ Development of a tourist "portrait"; □ Analysis of the structure of tourist expenses; □ Development of a behavioral profile of a tourist; □ Determination of points of attraction for tourists; □ Storage of various types of content (documents, photos, presentations, etc.); □ Justification of management decisions;	□ Hotel management software; □ guest preference analysis when booking; □ direct booking from the website; □ hotel services marketing and advertising; □ hotel website metrics (indicators); □ wearable devices (guest card/key replacement); □ hotel property management; □ service pricing management;

	□ Development of ratings based on various indicators, including consumer reviews	□ social media management and monitoring; □ hotel performance analysis
Virtual reality	□ Familiarization with attractions when planning a travel route; □ virtual tours of cities, attractions, natural sites, museums, exhibitions; □ use in marketing and promotion of tourist products and services; □ development of unique programs to stimulate tourists' interest in new routes; □ reduction in advertising costs; □ use of helmets/glasses to enhance tourists' impressions of the proposed routes and trips	□ Familiarization with the comfort of the room, the interior of the hotel when choosing a reservation; □ presentation of the advantages of the hotel in a 360-degree panoramic video; □ use in marketing and promotion of the hotel brand.

It seems that the current stage of digital transformation of Russian tourism should be considered as a transition period from "smart tourism" to digital. This is manifested in the fact that individual digital technologies are being introduced to solve the most pressing problems of management and organization of tourist services. This is the goal of government support measures for the development of tourism infrastructure, including the development of new tourist routes and navigation systems to them, tourist information centers, electronic guides, mobile applications and audio guides. Big data technology is increasingly used in the creation of online accounts by tour operators and travel agents for booking accommodation, transport, excursions and other services. Blockchain technology ensures the security of payments, identification of the traveler's identity, is used in the preparation of documents, check-in at airports and hotels. In the course of the digital transformation of the tourism sector, cloud technologies, the Internet of Things, virtual and augmented reality and other modern technologies are increasingly used, which allows for more efficient building of partnerships and improving the quality of service to tourists. Digital technologies are used to improve the quality of service to tourists.

Digitalization processes will significantly affect the further development of the tourism market. Many countries are adopting the “Tourism 4.0” development course, which, like “Industry 4.0”, implies the transition to digitalization of most business processes in the industry. Examples of best practices in the use of digital tools and applications in tourism include:

1. Implementation of sensor technologies at locations that create information, help to remember and transmit data.
2. Creation of an integrated solution to increase mobility, designed to facilitate and interact with the tourist with the destination.
3. Free, cost-effective and stable Wi-Fi connection for tourists and citizens in order to improve tourism management.
4. Production of mobile applications for smartphones and tablets to search for goods and services at destinations.
5. Use of QR codes that help tourists quickly and easily interact with the location.
6. Geolocation systems that help tourists determine the location of all attractions.
7. Video mapping and holography methods that enrich the tourist's cultural experience.
8. Effective management of the intermodal transport system.
9. Real-time traffic management systems supplemented by optimal route suggestions.
10. Marketing systems and a centralized booking system (CRS).

11. Customer relationship management system (CRM).

12. Video surveillance systems in metro tunnels and in unsafe areas.

Thus, digitalization can accompany almost all stages of the formation and promotion of a tourism product. Underestimating the importance of introducing digital technologies into all areas of the tourism market in modern conditions means missing a competitive advantage and weakening the competitiveness of not only a specific tourism organization, but also the entire region (country). It can be concluded that at present there are a number of objective prerequisites for the formation of a Russian digital smart tourism platform. First of all, this is the currently achieved high level of digitalization of the main business processes in the tourism and hospitality industry. In addition, the emergence of smart tourists and digital travellers entails the need for changes in the information and communication infrastructure and business models of the tourism industry.

The digital transformation is leading to far-reaching changes in the tourism industry, which have both a quantitative impact on the expected future development of employment and a qualitative change in job profiles and skills. At the same time, digital change in tourism also offers opportunities for new areas of employment, a more humane working environment and greater autonomy for employees. The main challenge is therefore to help shape digital change in tourism rather than simply react to it. The digital world is characterized in many ways by a new quality of digitalization. Firstly, advances in IT and software continue to drive exponential growth in processor performance. In addition, the penetration of mobile devices and the use of cloud applications are increasing. The collection and systematic evaluation of large volumes of data (Big Data) and the development of learning algorithms are also leading to an increasing prevalence of artificial intelligence. Secondly, improvements in IT are reducing the size and cost of systems, while expanding the scope of application and usability. Thirdly, developments are moving towards larger networks, resulting in the emergence of cyber-physical systems (the "Internet of Things"). Although tourism is not considered a pioneer in terms of digitalization, technological progress has long since taken hold of the tourism industry.

The use of digital technologies in tourism has become indispensable. The reasons are the changed customer needs, which are increasingly changing due to the use of the Internet for information and booking purposes and therefore entail corrective reactions on the part of tourism service providers, creating the technical and organizational prerequisites for digital communication with customers. Also, the spread of digital technologies is based on the cost-benefit ratio, since rationalization effects can be achieved through standardization and centralization with the help of digital applications.

Conclusions

Further development of domestic and inbound tourism, increase in tourist flows, growth of requirements for service quality require more active pace of digital transformation of the tourism sector. In accordance with this, it seems necessary: to develop and implement standard technical and technological solutions, provide loans and subsidies for these purposes; create online courses on training personnel skills for micro, small and medium enterprises for which the acquisition and installation of appropriate technical equipment and software is highly expensive; it is advisable to expand the practice of small businesses to use the services of tourist marketplaces to enter the market and promote their products and services; to intensify the dissemination of best practices in the introduction of digital technologies in the management and organization of tourist services in both large and medium and small tourism businesses. Since the bulk of organizations and enterprises in the tourism sector are micro, small and medium enterprises for which the acquisition and installation of appropriate technical equipment and software require large additional costs, it seems necessary to develop and implement standard technical and technological solutions, provide loans and subsidies for these purposes, create online courses on training personnel skills. At the same time, it is advisable for small businesses to use the services of tourism marketplaces to enter the market and promote their products and services. The importance of state support and support at the regional level at this stage of digital tourism development

will increase, which poses a whole range of tasks for the dissemination of best practices for the introduction of digital technologies in the management and organization of tourist services in both large and medium-sized and small tourism businesses. It is advisable to create a digital smart tourism platform on the terms of a public-private partnership, taking into account the interests of both commercial structures and the state, as well as citizens traveling and living in tourist destinations. To do this, it is necessary to achieve coordinated cooperation and integration of the interests of government organizations, private companies and local governments, as well as local representatives of government structures and communities. This will stimulate and control general participation at various stages of the development of the tourism destination. Only in this case can we talk about creating prerequisites (in terms of digital solutions) for the effective development of tourism at the international, national and regional levels.

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Credit Authorship Contribution Statement

Ulviyye Huseynova: Writing – review and editing, Methodology, Supervision, Project administration;

Ismayilova Hecer Qafar: Writing – original draft, Investigation, Visualization;

Gasimzadeh Akrami: Writing – original draft, Methodology, original draft, Data curation, review and editing, Formal analysis.

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Declaration of Use of Generative AI and AI-assisted Technologies

The authors declare that they have not used generative AI and AI-assisted technologies during the preparation of this work.

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SYSTEM OF INNOVATIVE TECHNOLOGICAL DEVELOPMENT OF INDUSTRIAL ENTERPRISES IN MODERN CONDITIONS

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Abstract

This article raises the problem of achieving technological sovereignty in modern conditions: the task of providing the country with an import-independent and competitive product, for which it is necessary to create our own new technologies, conduct research and development (R & D). Achieving technological sovereignty is a complex process that includes the tools of the innovation process, R & D and technological development of production. The article presents the "symbiotic" concepts of "innovative technological development" and "system of innovative technological development", and proposes a definition of the latter. Key elements of the system of innovative technological development (SIDT) in the process of activity of an industrial enterprise in modern conditions are highlighted. It is concluded that the creation of a system of innovative technological development will allow domestic industrial enterprises to achieve the goal of technological sovereignty.

The aim of the study is to systematize theoretical and methodological provisions concerning the development of innovative activities in the context of digitalization of the economy, and to assess the relationship between the results of innovative activities and information technologies.

The subject of the study is a set of organizational and economic relations arising in the process of formation of innovative and technological development of industry. The object of the study is the process of innovative and technological development.

In conducting the research and developing theoretical positions, general and specific methods and techniques of economic research were used: calculation and analytical, grouping, analogies, expert assessments, forecasting.

The article examines the analysis and methods of the process of innovative development in industrial enterprises, the sequence of stages of the product life cycle and their stages in the implementation of new technologies (process innovation), a list of stages of creation and implementation of product, process and management innovations in modern conditions.

Digitalization means the penetration of digital technologies into most areas of economic activity - their use not only in the production of goods, but also in the organization of economic and social processes, the construction of interactions and connections. Innovative activity, mediating the creation, commercialization of new digital products and services, technologies and methods of implementing business processes, management and work with personnel, remains in the context of digitalization the type of activity through which economic entities form and strengthen competitive advantages, integrating into the digital ecosystem.

Keywords: *innovation process, system, technological development, technological sovereignty; digital.*

JEL Classification: O32, Q55.

Introduction

In the current new conditions of activity for the economy and industry, the key task is to achieve a state of technological sovereignty and implement programs for import substitution of products and technologies with their own solutions and developments. The relevance of this global goal in a tactical sense is dictated primarily by the unavailability of imported, as well as the absence of domestic solutions for the normal functioning of industries, the work of existing industrial enterprises and the implementation of development projects for the construction of new industries, as well as the breakdown of traditional logistics supply chains for import and export directions and the global transformation of sales markets. Achieving technological sovereignty is a complex process that includes the tools of the innovation process, R & D and technological development of production. Each of these three concepts is quite traditional and systematically described, but has obvious gaps, and what is more important - today there is no concept that would combine the tools within the framework of these different areas of activity: innovation, R & D and technological development. Of course, these concepts are in many ways "related", for example, R & D is often an integral part of the innovation process, and the results of R & D are implemented in production as part of technological development programs.

Literature review

Since the concept of "technological sovereignty" is directly related to the above concepts and runs like a red thread through the entire article, it is advisable to conduct a brief analysis of this concept. In the course of the review of scientific literature, it was revealed that there is no single definition of the concept of "technological sovereignty", since the term is characterized by its multifaceted nature. However, two main approaches can be distinguished among researchers to defining the concept: the first is based on the concept of "sovereignty", and then the term "technological sovereignty" is used in the meaning of the independence of domestic industries from external technologies and the ability to provide themselves with domestic products based on their own technologies [3-7]. The second approach is based on a multilateral/multifaceted consideration of the concept. For example, researcher Afanasyev A.A. [8] identifies six aspects or perspectives of the problem of technological sovereignty: economic-theoretical, system-security, institutional, production, industrial-political, and criteria-evaluation.

The researcher emphasizes that one of the possible problems of the lack of a unified interpretation of the concept of "technological sovereignty" is the impossibility of a scientific solution to the issue of assessing the achieved level of technological sovereignty. However, it is impossible to carry out in the absence of appropriate criteria and indicators of comparison. Achieving a state of technological autonomy and independence is impossible without development. "Technological development" is characterized by the mandatory condition of innovation [9]. As many domestic and foreign scientists note: "Investments in innovation are an important condition for increasing the rate of long-term economic growth" [10]. At the same time, the concept of "innovation" has many definitions [11], a significant part of which boils down to the fact that innovation is a certain novelty that has been developed and commercialized (implemented) [14]. Therefore, technological sovereignty has an obvious connection with innovation and the innovation process. It is worth noting that we are also talking about the creation of our own new technologies, that is, about the process of conducting research and development (R&D), considered within the framework of innovation management [7], since in this case the innovation does not arise by itself, but is the result of research and development and, in order to be implemented, must go through the stage of experimental design development. On the other hand, a significant part of the products that are covered by the concept of "technological sovereignty" must be physically produced products of the domestic industry and specific industries. From this point of view,

technological sovereignty is inextricably linked with the issues of technological development of industry and modernization of production, since a new innovative product must be implemented in a modernized production within the framework of using new technology and the operation of new production lines and equipment. Achieving a state of technological sovereignty automatically leads to the implementation of import substitution programs, to the development of our own unique solutions and is more high-level. An example is the country's chemical industry and related downstream industries.

The task of achieving technological sovereignty set by the country's leadership is decomposed into each industry in the form of a specific task: creating integrated chains of processing petroleum feedstock into specialty chemical products to import-substitute raw materials for final industries and produce domestic products. A "stage-by-stage" or "partial" solution to this problem, when examined in detail, does not allow achieving the goal (providing the country's economic sectors with their own sovereign product), since stage-by-stage and partial implementation boils down, for example, to replacing an imported product with a domestic one, but produced from an imported semi-finished product (predecessor). This project falls into the "import substitution" category, but does not solve the problem of technological sovereignty, since it changes the need for one imported product to the need to use another imported precursor product.

The ultimate goal in this direction is to create chains of processing integrated into domestic raw materials to final products consumed by the economy, based on domestic technologies. In this case, the state of "sovereignty" is really achieved, when there is no dependence of industries on external products, semi-finished products, technologies and solutions in critical areas - when industries are able to provide themselves with domestic solutions and technologies. Summarizing the above, we can conclude that there are a number of difficulties in correlating the concepts of "technological sovereignty", "technological development", "import substitution", "innovation", "R & D", and obvious shortcomings of the theoretical and methodological base in each of them, which does not allow these components to work within a single system leading to the achievement of technological sovereignty. Therefore, the author of this article proposes to comprehensively consider such a tool as a system of innovative technological development, the development and implementation of which can help domestic industrial enterprises achieve the goal of technological sovereignty.

Based on the identified shortage of works on the topic and the absence of methodological tools for solving the current problem, this article presents the results of a large-scale study. The most important current task today is the creation of a certain system that will achieve the goals of technological sovereignty and can be implemented at the enterprise level. Thus, this article offers a theoretical description of the system of innovative technological development (hereinafter - ITD), combining and complementing the existing tools of the subsystems of innovation, R & D and technological development. It is assumed that the implementation of such a system will become the basis for achieving the state of technological sovereignty and will maximize the final economic effect of this activity both within individual industrial companies and industries, and within the economy of the country as a whole.

Research methodology, data, results and discussions

The most important characteristic of the current stage in industrially developed countries is the transition to an innovative type of development. The innovative type of development, based primarily on the constantly increasing power, capabilities and strength of science and technology, is becoming the dominant line in the development of modern civilization. It is based on a continuous and targeted process of searching, preparing and implementing innovations, which allows for increasing the efficiency of social production, the degree of realization of the needs of society and its members, and ensuring the improvement of the life of society. Of particular importance are modern institutional changes aimed at increasing the adaptation of society to rapidly occurring technological changes, the development of methods for determining priorities in technical and economic development and mechanisms for their implementation.

The development of innovative activities in the context of digitalization of the economy is becoming a factor of economic growth, a means of strengthening the competitiveness of enterprises both within the country, at the regional level, and on a global scale. Innovative technologies play a decisive role in the creation of new goods and services, contributing to an increase in labor productivity, and, consequently, factor income and welfare of the population. The development and implementation of new information, communication, digital technologies is currently at the forefront of scientific and technological progress: the fourth industrial revolution is determined by innovative development based on the digital transformation of business processes.

This article applies a systems approach, methods of analysis and synthesis, classification and generalization, the method of monographic research. The theoretical and methodological basis of the study was the works of domestic and foreign researchers on regional and sectoral economics, as well as regulatory legal acts.

Results obtained. In order to synchronize the concepts of "innovation", "R & D" and "technological development" with the aim of integrating them into a single system of innovative technological development (SIDT), it is necessary to take into account the following main barriers.

1) The absence of a unified definition of the concept of "innovation" in the context of achieving the goals of technological sovereignty. As noted above, there are many definitions of the concept of "innovation", and if we try to generalize them, they come down to the fact that "innovation" is a certain novelty that, as a result of development and commercialization, reaches the level of final application and obtaining an economic effect. Within the framework of technological sovereignty, the task of creating one's own (sovereign) product is at the forefront, while it is not necessarily new (innovative) within the framework of the global economy. This requirement for the product to be innovative is not critical to the process of achieving technological sovereignty. The opposite situation may also arise: the product may be completely new, that is, innovative, but not critical for ensuring the country's industry. In this case, it is not a product aimed at achieving technological sovereignty. Thus, it can be concluded that the concept of "innovation" has an obvious and indirect correlation with the tasks of technological sovereignty and therefore cannot always be used as a tool for achieving a state of technological independence and autonomy. It is necessary to take this factor into account when forming the tools and elements of the created system of innovative technological development.

2) The lack of an effective methodology for managing the innovation process for industrial innovations in the context of the need to achieve technological sovereignty. The innovation process is a widely described concept [8], but it still has obvious gaps in cases of its application to modern conditions of activity. Firstly, existing approaches to defining the concept, as a rule, describe in detail the stages of the innovation process, while the primary source of innovation - the "driver" of this process, the customer - remains unclear. It is assumed that the innovation process is launched from a certain point (generation, emergence of innovation), which can be scientific institutes, researchers, startups, developers, and then goes through stages. However, industrial companies operating specific production facilities and implementing projects to build fundamentally new production facilities often do not participate in this process. At the same time, achieving technological sovereignty is a task at the level of the state, the country's economy, industries and large companies: they are the customers and "drivers" of this process. Thus, existing methodologies for managing the innovation process can work and provide an economic effect only if the issue of the customer ("driver") of industrial innovations is resolved. Secondly, scientific research is an integral part and a critical limiting stage of the innovation process, if we are talking about industrial innovations, while the process of achieving technological sovereignty itself is largely associated with the concept of "industrial innovations". At the same time, in existing methodologies for managing the innovation process, the R & D stage is only one of the stages, and insufficient attention is paid to it. In the context of industrial innovation, the R & D stage can take from 1-3 years to 10 years, until the practical application of the innovation. During such a long period, markets, macroeconomic conditions and other factors change, which affect other stages of the

innovation process and actually make the current methodology of the innovation process ineffective for the case of industrial innovation.

3) Lack of integration of production modernization and technological development processes, the role of R & D and innovation in them. The processes of production modernization and technical re-equipment are described quite well, but an obvious barrier is the fact that the role of R & D and innovation in them is minimized. This is a natural follow-up to the goal-setting of the production modernization process: its main goals, as a rule, are to increase the reliability of production, achieve product quality, comply with environmental directives and labor protection and industrial safety (OH&S) standards, but the introduction of a new (innovative product) is rarely the goal of the process of technological re-equipment and modernization of production.

In turn, this causes a two-sided problem: the processes of industrial innovation and R & D, on the one hand, and the processes of production modernization, on the other hand, are not synchronized and are not built as a single system, and often even contradict each other. For example, it is obvious that innovations in the context of production modernization can lead to a decrease in its reliability, since the process of pilot industrial production carries increased risks (both external (e.g. economic, political and legal, scientific and technical, etc.) and internal (e.g. safety of work, financial losses, information risks, risks associated with the use of labor resources, risks associated with the use of intellectual capital, etc.)).

4) Lack of a methodology for the commercialization of industrial innovations. In the context of the description of the innovation process, the key stage is the commercialization of the innovation, since it means the introduction of the product and obtaining an economic effect, however, the main emphasis in the description of this stage is not on industrial implementation, but rather on issues of markets, clients, partners, etc. These issues are certainly important, but the key aspect of industrial innovation commercialization is the engineering stage (E&D), which follows the scientific research stage (S&R). It is obvious that the process of industrial innovation commercialization is the final stage of the process of achieving technological sovereignty, but there is no serious description by researchers of this stage and its place in the system of the innovation process of an industrial enterprise.

5) Limited role of R&D and scientific research in industrial innovation. On the one hand, the task of technological sovereignty can be solved by introducing a new (innovative) product for the industry into production, but there is a related issue of the profitability of such production, which increases with the transition to products of the following stages. The key problem in the implementation of such projects is the insufficient capacity (consumption) of the Russian market, that is, the product is critically needed for the industry, but its consumption is low compared to the minimum payback capacity of production (the minimum productivity at which the project for its creation is economically efficient). This factor is a fundamental problem and a barrier, as it means that this imported product, produced at larger foreign capacities, will always win in cost and price against a domestic product produced at low capacity. The solution to this issue, based on economic prerequisites, comes down to increasing capacity and sales volumes, that is, realizing the export potential, and this, in turn, means that the product must be competitive in cost, which is determined by the technology of its production, which is ultimately a product of the R & D process. Thus, we can conclude that a critical condition for creating a system of innovative technological development is the integration of the R & D process, ensuring the creation of not only an innovative product for the domestic industry, but also the ability to win the competition in foreign export markets. The above barriers are not the only ones, there are other shortcomings in the existing systems and methodological entities of innovation, R & D and technological development, which do not allow the existing tools to be automatically harmoniously and effectively combined into a single system. Therefore, theoretically, the state of technological sovereignty cannot be achieved. Hence the need to develop such a system that will ensure synergy and economies of scale, will increase the chances of releasing a product that is competitive in cost and in demand by the market.

Taking into account the above, the concept of the "System of Innovative Technological Development" (SIDT) proposed by the author of this article, namely the further application of its

principles in practice, is intended to help solve an extremely urgent problem in modern conditions - achieving a state of technological sovereignty. This will also fundamentally solve the issues of import substitution and will allow achieving a fundamentally higher economic effect from innovations within individual industries and the economy of the country as a whole. In addition, the implementation of SIDT will avoid the above barriers.

Firstly, unlike the processes of innovation management, within the ITR system, the primary goal will be the creation of a domestic sovereign product and/or technology, regardless of the degree of its innovativeness, but based on the need to create its production within the country or region.

Secondly, the fundamental starting point in the ITR is the strategy of technological development (of the country, region, industry and company), which is absent within the description of the innovation management process. Therefore, this element of the ITR is innovative and extremely important, since it is the starting point for launching the further process of creating innovations and R & D.

Thirdly, within the ITR, the processes of R & D and technological modernization of production are synchronized. It is important to note here that the modernization of production within such a system should meet the goals of technological sovereignty of the industry, country, company, and not local (point) goals to which modernization is usually aimed. This will make it possible to use the results of R & D, and this is the difference from the approach in which technological modernization is based not on scientific developments, but on existing foreign technologies. And finally, within the framework of the ITT, a system/process of commercialization of industrial innovations is being created, which has been poorly studied by domestic economists and is associated with many uncertainties.

It is worth noting that the created system of innovative technological development should be adaptive and flexible, that is, applicable to companies of any type from various industries. This imposes certain requirements on the components of the ITT, each of which should be described in sufficient detail to be practically implemented and remain flexible to be able to adapt it to the real conditions of the industry and the company. Thus, the following key components (elements) of the system of innovative technological development (ITD) can be identified:

1) Strategy for technological development of companies, industries and technological sovereignty. As noted above, there is a fundamental problem of the "customer of innovations", which in practice leads to low efficiency of the innovation process as a whole, especially in the field of industrial innovation. As a rule, innovations are initiated by research teams and developers who are not integrated into the development strategy of either individual companies or the industry as a whole, and what is even more important is that innovations are developed and implemented not in predetermined areas, but based on accumulated scientific reserves, which ultimately makes innovations unclaimed within real companies and industries. The strategy of technological development is the first key element of the SIDT, the creation of which will allow, at the level of companies, the industry and the country, to determine the key areas for achieving technological sovereignty in the form of specific products and technologies to be developed within the framework of innovation and R & D processes. Thus, the creation of a strategy for technological development is the starting point of the process of achieving technological sovereignty and the accompanying processes of innovation and R & D. The development of such strategies, in turn, will provide the basis for generating a strategy for the technological development of the industry, and the comparison and unification of industry strategies will lead to the creation of a strategy for the technological development of the country as a whole. Such a system of level synchronization of strategies will create a basis for the effective allocation of state support for scientific and technological development projects of the country. This will allow targeted support for the most capital-intensive stages of the industrial innovation process, namely the stage of pilot industrial development of technology, which requires the creation of an expensive, but often non-recoupable, pilot industrial installation for the purpose of scaling it up and moving on to the design and construction of an industrial installation.

2) The process of searching for technologies and building a technological landscape. Continuing the logic of the previous point, if the directions of technological development at the strategic level are defined, the next necessary step is not always the beginning of development based on the existing fundamental scientific groundwork, namely, building a technological landscape by assessing and searching for technologies. As a rule, within the framework of domestic science, there are accumulated scientific groundworks in all areas, but there are two fundamental problems: firstly, the competitiveness of such technologies is often not high, secondly, in some cases it takes up to 7-10 years to complete the R&D stages and bring the innovative product to the commercialization stage, and the product is needed today, and this is the point of synchronization with the tasks of technological sovereignty. Building a technological landscape and targeted selection of technology is a key element of the SITR, as it allows you to consciously select those areas in which the created product will be competitive and brought to the market within the specified time frame. The presence of this element in the ITS makes the system itself effective for achieving the goals of technological sovereignty. Thus, now the preceding stage within the ITS is the search for existing technologies and ways to implement innovation (R & D) in the fastest possible way.

3) Methodology for assessing and selecting projects and methodology for portfolio management of ITS projects. The task of technological sovereignty is global, and its solution occurs in the context of a lack of resources - financial, time, human. It would be impossible for one company or industry to develop and implement all ITS projects, in connection with which the key element of the ITS is the ITS project portfolio management system and the project assessment and selection methodology, which together allow you to determine priority projects for implementation based on clearly developed assessment criteria, and carry out system management of the total portfolio of ITS projects. For this purpose, it is proposed to create a system for prioritizing and compiling a project portfolio based on three groups of criteria: feasibility (from TRL and own competencies), potential maximum economic effect and compliance with the strategy of technological development. This mechanism allows for the initial selection of projects that correspond to the strategy and their ranking in a two-dimensional matrix of "feasibility - maximum potential effect".

4) Organizational design, management mechanisms and R & D management processes. Traditionally, R & D processes are carried out within research institutes, but in modern conditions this model does not allow for quick results in the field of creating new products for a number of reasons, since there is no synchronization at the strategic level of the research directions of institutes with the tasks of technological development of industrial companies. Also, the lack of qualified specialists, scientists, researchers within the industrial companies themselves does not allow them to be qualified R & D customers. The solution to this problem lies in the creation of large industry development centers within one or several key industrial companies, which would concentrate the efforts of scientific researchers, engineers, technologists, and commercialization specialists. This will allow creating the opportunity to work on the full cycle of the engineering and technical system within such centers. At present, observing the activities of scientific organizations, one can notice that many of them are responsible for the fundamental stage of development, while the commercialization stage is given little attention or is ignored. At the same time, industrial enterprises and large corporations do not have the tools to implement innovations, since there are no necessary mechanisms and relevant practices, and, therefore, no personnel capable of conducting fundamental research following the example of scientific organizations. Therefore, within the framework of the SITR of enterprises, it is proposed to create centers (structures) that are responsible for both engineering and commercialization of innovations, which did not exist before. Scaling such a SITR model to large corporations will increase the overall effect of implementing innovations in the country several times.

5) New hybrid methodologies for managing engineering and technical projects. Industrial innovation projects have a clearly defined specificity: their successful implementation is possible only after going through all stages of the innovation process, R&D and commercialization, which takes

several years, and at different stages of implementing engineering and technical projects, the specificity of the project itself changes fundamentally. At the early stages of the engineering and technical process, the degree of uncertainty is very high, costs are low and the optimal solution is to use flexible project management systems, such as Agile. Thus, for the successful functioning of the engineering and technical project as a whole, it is necessary to create a hybrid management methodology with its own toolset that changes during the transition from stage to stage. Thus, a new approach and toolset for project implementation are proposed, starting with flexible methodologies and smoothly moving to the RMR methodology from the engineering stage.

6) The process of engineering new technologies - recreating the function of industry institutes. Upon successful completion of the R&D stage, the engineering and technical project moves to the R&D stage, within which the necessary element is the engineering of the new technology. This task was previously solved by industry institutes, but in modern conditions the task is much broader: it is necessary to create engineering centers capable of developing engineering, design and technological solutions using proprietary technology that has no analogues, producing initial design data at the output, which are the input data for the beginning of the design process carried out by design institutes.

7) Methodology for commercialization of industrial innovations. As noted above, the commercialization stage is described within the framework of the created methodologies of the innovation process, however, with regard to industrial innovations, it is necessary to develop a separate methodology that would take into account all optional possibilities for implementing technologies within the industry as a whole at specific production facilities, not limited to the developer's site only, and would allow for the formation of the fastest effective mechanisms for implementing technology for the purpose of producing and releasing the product to the market. We are talking about the commercialization of industrial innovations. The very concept of "commercialization of industrial innovations" comes down to industrial implementation within the framework of production. Accordingly, such commercialization includes the engineering stage, which is not implied in the simple commercialization of innovations, and integration into the process of technological modernization of production [8].

8) The system of licensing, technology transfer and intellectual property management. One of the global areas of commercialization of industrial innovations is technology transfer through licensing, which provides the country and industry with the opportunity to obtain a product, and for the developer company - to achieve an economic effect from innovations. As part of the development of this element, it is necessary to create a separate pricing methodology in the market of technological licenses that are a product of industrial innovations. The most important element of the SITR is also the creation of an end-to-end intellectual property management system at all stages of the life cycle of an ITR project, based on the concept of "patent protection strategy". The creation of this element will ensure full protection of the developed solution in the technology market when implementing technology transfer transactions.

9) The mechanism for the creation and management of a managed innovation ecosystem. One of the key elements of the SIDT is the creation of innovation ecosystems (IES) or ecosystems of partners of a new type, which would allow to achieve industrial innovation goals faster and maximize the economic effect from the implementation of new projects, thus solving the problem of technological sovereignty. It is worth noting that the very concept of IES is quite well described and studied in the literature, but in modern conditions, current IES are not effective enough to achieve the goals of technological development of companies and industries, since IES participants have a significantly lower development speed, are not synchronized with each other (their process is not built as a system and covering the entire cycle of ITR projects). In this regard, it is necessary to create a new, separate type of ecosystem of partners, which, within the framework of the SIDT, would be able to create the final sovereign technological product in the shortest possible time due to the coordinated action of its participants at all stages of the SIDT life cycle.

10) Center (entity) and mechanisms of SITR management. The most important summarizing component of SITR is the entity managing the system, which carries out the management process itself and is responsible for achieving the final result - the implementation of the goals of technological development. The organizational design of this Center can be different and is adaptive, but its key elements are the presence of structures that implement the work of the SITR elements described above, this is the fundamental principle laid down in the organizational design of the SITR management center. Within the existing innovation management centers (R & D) in large corporations, a number of functions are missing, for example, departments responsible for the commercialization of industrial innovations, engineering, scouting. Within the SITR, it is proposed to transfer the management of the system to departments implementing the strategy of technological development of the enterprise, which will ultimately ensure a full cycle of the innovation process: from strategy to implementation.

11) System of training and development of personnel for SITR. The most important component and fundamentally necessary basis, which runs through all stages of the ITS, is the personnel training and development system, which should be built based on the functionality and tasks at each stage of the ITS. This system is based on the formation of competency profiles of specialists capable of implementing tasks within the framework of the ITS management center.

Conclusions and prospects for further research

Thus, this article proposes the concept of an innovative technological development system (ITD) - a development system consisting of interrelated elements:

- a strategy for technological development;
- a process of searching for technologies and building a technological landscape;
- a methodology for portfolio management of ITS projects;
- organizational design, management mechanisms and R & D management processes;
- hybrid methodologies for managing ITS projects;
- a process of engineering new technologies (recreation of the function of industry institutes);
- a methodology for the commercialization of industrial innovations;
- a system of licensing, technology transfer and intellectual property management;
– a mechanism for creating and managing a managed innovation ecosystem;
– a center (entity) and mechanisms for managing the ITS;
– a system for training and developing personnel.

The elements that make up the ITS system and the tools proposed within their framework are intended to assist enterprises in the processes of:

– searching for existing technologies and ways to implement innovations;
– implementing innovative products and/or technologies based on the goals of industry strategies;
– selecting projects that correspond to the strategy of technological development;
– integrating the engineering stage into the ITS cycle and into the process of technological modernization of production;
– ensuring a full cycle of the innovation process: from strategy to implementation.

Thus, the implementation of the system of innovative technological development at industrial enterprises will allow achieving the goals of the strategy of technological development and will fundamentally affect the country's economy as a whole through the introduction and launch of its own new products and technologies on the market, which will thus solve the problem of innovative development of the economy.

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