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**The Climate Change System - Introduction
Uvod v sistem klimatskih/podnebnih sprememb**

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2008



Prof. Dr. Timi Ećimović, Prof. Emeritus DDr. Matjaž Mulej

1.

The Climate Change System - Introduction

Uvod v sistem klimatskih/podnebnih sprememb



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Knjigo posvečava gospodu Jožetu Janu, starosti slovenskega inovatorstva in okoljevarstva, ob 95. letu!

The book is dedicated to Mr. Jože Jan, the doyen innovator and environmentalist in Slovenia, at his 95!

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1. Predgovor

H. E., baron, konjeniški polkovnik, akademik, profesor doktor Roger Haw Boon Hong

Veseli me in počaščen sem, da imam priložnost sestaviti predgovor h knjigi »Uvod v sistem podnebnih sprememb«, za kar sta me prosila avtorja. V knjigi prezentirata na najkrajši možen način tako velik sistem. Mislim, da je sistem klimatskih sprememb zelo pomemben za sedanjo človeško civilizacijo in za vsakega posameznika na planetu Zemlja. S sistemom klimatskih/podnebnih sprememb je tako, kot pravi Shakespeare: »Biti ali ne biti«.

Univerza ANSTED že dalj časa podpira sodobne raziskave okoljskih znanosti in sistema podnebnih sprememb. Knjiga T. Ećimovića, M. Muleja in R. Mayurja »System Thinking and Climate Change System (Against a big »tragedy of commons« of all of us)« je bila osnova nominacije za Nobelovo nagrado 2003 in je predstavljala vrh sodobne znanosti in pojmovanja sistema klimatskih/podnebnih sprememb ter še danes predstavlja najboljšo možnost za spoznavanje sedanjega stanja v biosferi planeta Zemlja.

Sistemska teorija, razmišljanje, analiza in sinteza kot orodje raziskovalcev za boljše spoznavanje narave niso bile v pogosti rabi pri raziskavah naravoslovja. Po uvedbi sistema klimatskih/podnebnih sprememb in informacijske teorije narave (Ećimović 2006 ter nominacija za Nobelovo nagrado iz fizike 2007) je univerza ANSTED predstavila trajnostno prihodnost človeštva v dveh knjigah; prva je: T. Ećimović in ostali, 2007, »The Sustainable (Development) Future of Mankind«, , in druga je: S. Božičnik, T. Ećimović, M. Mulej in soavtorji, 2008, »Sustainable Future, Requisite Holism, and Social Responsibility (Against current abuse of free market society)«. Pojavlja se imperativ, da se sistem klimatskih/podnebnih sprememb predstavi svetovni in lokalnim skupnostim na kratko.

Knjiga T. Ećimovića in M. Muleja, 2008, »Uvod v sistem klimatskih/podnebnih sprememb«, je prva kratka predstavitev klimatskih sprememb v angleščini in slovenščini. Upamo, da bomo nadaljevali s prevodi v druge jezike. V kratkem pričakujemo kot naš prispevek k razumevanju klimatskih sprememb po svetu prevode v: kanadsko angleščino in francoščino, kitajščino, korejščino, italijanščino, nemščino, ruščino in druge.

Mislim, da je zelo pomembno, da se znanje o sistemu klimatskih sprememb posreduje široki svetovni in lokalnim skupnostim, da bi preprečili razočaranje in pospešili blažitev učinka delovanja sistema klimatskih/podnebnih sprememb na svetovno človeško skupnost in biosfero, ki je edini dom človeštva. Komplementarna knjiga T. Ećimovića in ostalih, 2006, v angleščini, »Naš skupni sovražnik je nevarnost delovanja sistema klimatskih/podnebnih sprememb«, vsebuje priporočila za izhod iz svetovne krize v trajnostno/sonaravno prihodnost človeštva. V nadaljevanju sta bili objavljeni inovacijski prezentaciji dveh knjig o trajnostni/sonaravni prihodnosti človeštva.

Prosim, da sprejmete moje priporočilo za branje te knjige, tega novega prispevka ANSTED Univerze k trajnostni/sonaravni prihodnosti človeštva.

Roger Haw Boon Hong, profesor za družbeno odgovornost, ustanovitelj univerze ANSTED in ustanovitelj ter predsednik ANSTED-ove mednarodne nagrade za družbeno odgovornost ASRIA.



2. Povzetek

Pojem sistem ima veliko vsebin. Tukaj nam ne bo pomenil niti miselne slike o obravnavanem pojavu ali procesu niti običajne metode dela niti družbeno-gospodarske ali kakšne druge trajne ureditve niti spleta rastlin ali kamenin ali ljudi, ki nekako spadajo skupaj, ampak pojav, ki je tako zapleten po svojih sestavinah, povezavah in vplivih med njimi ter posledicah, da ga je težko povsem dojeti in še težje obvladati. Zato govorimo o sistemu klimatskih/podnebnih sprememb. Ne pomaga nam veliko, če ga dojamemo in/ali obvladamo po delih, saj ima kot celota bistveno drugačne lastnosti, kot jih imajo deli vsak zase. Nazorni primeri: jedilna sol je kot splet/sistem/sinergija sestavljena iz dveh strupov; voda je kot splet/sistem/sinergija sestavljena iz dveh plinov; organizacija je kot splet/sistem/sinergija sestavljena iz mnogo – medsebojno nujno različnih in zato dopolnilnih – strokovnjakov; hiša je splet/sistem/sinergija iz opek/betona/lesa, vrat, oken, električnih, vodnih in drugih napeljav itd; sinergije lastnosti delov dajejo novi celoti, katero sestavljajo nove lastnosti. Zato bomo resnico lažje spoznali in težave ter razvoj lažje obvladali, če obravnavamo pojav čim bolj celovito namesto po posamičnih delih. Pogoji za to je čim bolj celovito obnašanje ljudi, t.j. opazovanje, dojemanje, razmišljanje, čustveno in duhovno življenje, odločanje in uresničevanje odločitev, iz česar izidejo čim bolj celovita spoznanja in drugi izidi. Temu rečemo sistemski pristop. Popolne celovitosti običajno nismo sposobni doseči, ena sama specializacija – en sam poklic ali en sam vidik – pa nas omejuje na navidezno celovitost. Zato upoštevamo Muleja/Kajzerjeva (1998) zakon zadostne in potrebne, t.j. primerne celovitosti. V primeru klimatskih/podnebnih sprememb bi to pomenilo, da jih bi dojeli, če bi povezali spoznanja iz fizike, kemije, biologije, zgodovine, tehnologije, ekonomije in še kakšne vede in prakse. Izbrali in zbrali bi stroke in vidike, ki bi jih vse šteli za bistvene in medsebojno odvisne. Po vzoru iz starogrške filozofije bi jih povezali na osnovi soodvisnosti ali – z grško besedo – dialektike. Dobili bi dialektični sistem (Mulej 1974, glej Mulej 2008), ki pa ne pomeni zapletenega pojava, ampak miselno sliko o njem, katero sestavimo, da bi dosegli primerno celovitost svojega obnašanja, pa tudi spoznanj in drugih dosežkov/izidov.

Klimatske/podnebnne spremembe z učinki globalnega segrevanja, nenadnih naravnih katastrof od tsunamijev, poplav, viharov, sušnih obdobij do sprememb v klimi/podnebnju v lokalnih območjih, kjer ljudje živijo v lokalnih skupnostih, so danes najpomembnejša sprememba v biosferi planeta Zemlje. Ogrožajo današnjo civilizacijo človeštva.

Sistemski pristop k raziskovanju nastajajočih klimatskih/podnebnih sprememb mora zato v sinergiji upoštevati marsikaj, kar kažejo sodobna znanost, obdobje globalizacije - ki prihaja, sedanja razvitost človeškega družbenega sistema, življenje v velikih mestih, ki se po vsebini močno oddaljuje od narave, upravljanje tehnologij brez trajnostne ali sonaravne vsebine, pomanjkanje družbene odgovornosti¹ posameznikov in gospodarskih subjektov, nekontrolirana eksplozija reprodukcije človeštva, poznavanje kratkoročnih in od časa do časa mogoče srednjeročno ali celo dolgoročno škodljivih učinkov sintetičnih kemičnih izdelkov,

¹ Družbena odgovornost je lastnost ljudi in njihovih organizacij. Preprečuje ali vsaj lajša nevarnost, da bi ljudje zlorabili svoj vpliv in s tem škodovali sodelavcem, drugim poslovnim ali osebnim partnerjem, širši družbi ali naravi, od katere sta odvisna obstoj ali vsaj kakovost življenja ljudi. Taka je kratko povzeta opredelitev v mednarodnih uradnih dokumentih. Po drugih virih gre za nadgradnjo truda za inoviranje pod imenom izboljševanja in doseganja popolne kakovosti ali odličnosti. Tretji viri jo tesno povezujejo s celovitim obnašanjem, četrti pa tudi s trudom za mir na svetu (Hrast idr., 2006, 2007, 2008, itd.). Sedanje nevarno stanje klimatskih/podnebnih sprememb je v bistveni meri (draga!) posledica premalo odgovornega obnašanja ljudi v stoletjih industrializacije in tudi danes. Družbeno odgovorno obnašanje stane manj od družbene neodgovornosti vsaj na daljši rok in ob manj ozkem pogledu na lastno korist ljudi in njihovih pripomočkov, imenovanih podjetja in/ali druge organizacije, lokalne in globalne.



modernih tehnologij, vojaških tehnologij, eksplozijskih motorjev, transportnega sistema, nuklearnih tehnologij, industrije in kmetijstva, lokalne, nacionalne in mednarodne razdelitve politične in administrativne oblasti in njihovo delovanje na usmerjanje dela znanstvenikov ter posledičnega usmerjanja razvoja znanosti; vse to namreč povzroča čedalje večji razmak med življenjem ljudi in človeškimi globalnimi, nacionalnimi ter lokalnimi skupnostmi in naravo planeta Zemlja. Ta razmak grozi, da bo sedanja človeška civilizacija propadla.

V zadnjih letih vidimo v jeziku politikov in birokratov čedalje večjo manipulacijo pojmovnih in vsebinskih pomenov klimatskih/podnebnih sprememb, globalnega segrevanja, a jih uporabljajo sicer z veliko samozavestjo, vendar brez pravega poznavanja resničnosti sistema klimatskih/podnebnih sprememb. Trajnostna/sonaravna prihodnost človeštva ali harmonija človeškega sistema s sistemom narave/biosfere (Ećimović 2005; Ećimović Mulej, Mayur 2002; Božičnik, Ećimović, Mulej 2008) ni možna brez ustvarjalnega sodelovanja vseh ljudi za sinergijo – primerno celovitost. Zato je pomembno predstaviti sistem klimatskih/podnebnih sprememb tako, da ga razume navadni človek, ki naj bi aktivno sodeloval pri procesih, delu, ukrepih, vsebinah in spremembah v življenjskih navadah ljudi, ki so potrebne za trajnostno/sonaravno prihodnost človeštva. Še bolj je pomembno, da sistem klimatskih/podnebnih sprememb razumejo politiki in birokrati, ki krojijo svojo prihodnost in tako tudi prihodnost nas vseh pripadnikov človeštva na Zemlji.

Naš namen je predstaviti sodobni pogled znanosti na sistem klimatskih/podnebnih sprememb v slovenščini in v angleščini kot jeziku širokega spektra govorečih ljudi na svetu; v drugih izvedbah tega zapisa pa tudi v mnogih drugih jezikih. Predstavitve v posameznih jezikih niso prevodi, ampak izvirni prispevki z zelo podobno vsebino. Upamo, da bo naš prispevek doprinesel k možnosti sonaravne/trajnostne prihodnosti našega območja, območja naše države in vsega globalnega človeškega sistema. Trajnostna/sonaravna prihodnost lokalne skupnosti je pot do globalne sonaravne/trajnostne prihodnosti človeštva (Ećimović 1989).

Upamo, da bomo odgovorili na izzive sedanjosti in prosimo, da nas obvestite, če niste zadovoljni z našo predstavitvijo. Saj tako lažje dosežemo napredek v medsebojnem sporazumevanju.

Avtorja

Acknowledgment: To our families and sustainable future of mankind!

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4. Uvod v sistem klimatskih/podnebnih sprememb

4.1 Povzetek

Človeška družba prehaja v čas globalizacije, ki je vsebinski izziv današnjega časa (Ećimović 2008). Izraža sedanji status globalne človeške družbe. Zanj so značilne nenaravne življenske navade ali vsebine ljudi, ki živijo v velikih mestih, upravljanje tehnologij brez trajnostnih/sonaravnih vsebin, pomanjkanje dolgoročne odgovornosti posameznikov, držav in gospodarskih subjektov, nekontrolirana eksplozija reprodukcije človeštva, poznavanje le kratkoročnih in od časa do časa srednjeročnih škodljivih učinkov: sintetičnih kemičnih spojin, modernih tehnologij, vojaških tehnologij, eksplozijskega motorja, transportnega sistema, nuklearnih tehnologij, industrijske in kmetijske proizvodnje, lokalne, nacionalne in mednarodne razporeditve moči politikov in birokratov in njihovo usmerjanje dela globalnih, nacionalnih in lokalnih znanstvenih in šolskih institucij in izvajalcev vsebin. Vse to čedalje bolj povečuje razkorak med naravo in globalnim, nacionalnimi in lokalnimi sistemi človeške globalne skupnosti. Tako nastaja čedalje večji razmak med potrebami in rezultati sobivanja ljudi in narave planeta Zemlje.

Klimatske/podnebne spremembe, viharji, vetrovi, mogočne poplave in suše, tsunamiji, potresi, obsežna onesnaženja iz industrijske in kmetijske proizvodnje, mestnega življenja, transportnega sistema, spremembe v lokalnih klimatskih/podnebnih vsebinah, globalno segrevanje, tanjšanje ozonskega zaščitnega plašča ter onesnaževanja treh osnovnih sistemov biosfere zemlje, vode in zraka so vsebine napačnega dojetja sistema klimatskih sprememb na globalnem, nacionalnem in lokalnem področju človeške globalne družbe. Mistifikacija narave in neznanje o delovanju naravnih sistemov je vse bolj pogosta. Enostaven jezik za enostavne ljudi in razumljive razlage so vsebine uresničevanja trajnostne/sonaravne prihodnosti ali harmonije človeštva z naravo planeta Zemlje (Ećimović 2006/2008).

Poskušali bomo predstaviti pristop sodobne znanosti k mogoče najbolj pomembni vsebini današnjega človeškega globalnega sistema - sistema klimatskih/podnebnih sprememb. Mogoče je pomen tega še večji, ker se nahajamo ob prehodu v tretje tisočletje po Kristusu ali petnajsto tisočletje od prehoda rodovnega človeškega sistema k modernejšim oblikam sožitja in družbe – kameni, antični, srednjeveški, predindustrijski, industrijski, informacijski, inovacijski in globalni človeški skupnosti. Razumevanje vsebine sistema klimatskih/podnebnih sprememb ima bistven pomen za trajnostno/sonaravno prihodnost in možnosti preživetja človeštva v novo nastajajočih spremembah v kvaliteti življenjskih razmer in pogojev narave Zemlje. Trajnostna/sonaravna prihodnost lokalne skupnosti ali lokalnih skupnosti vodi v sonaravno/trajnostno prihodnost globalne človeške družbe (Ećimović 2006, 2008).

4.2 Uvod v sistem klimatskih/podnebnih sprememb

Globalne raziskave in znanstveniki, raziskovalna in aplikativna tehnika za reševanje kompleksnih problemov, uporaba raziskav na podlagi primerov, celostni pristop, t.j. sistemsko razmišljanje, izobraževanje in tudi druge navade in dejavnosti ljudi kot posameznikov in družbe naj bi v prihodnje čedalje bolj upoštevali sistem klimatskih/podnebnih sprememb, saj ima ta vedno bistven in morda uničevalen vpliv na kvaliteto življenjskih pogojev v biosferi – našem naravnem okolju. S sedanjimi navadami namreč ljudje ustvarjamo na planetu Zemlji razmere, ki so pred milijoni let onemogočale



življenje ljudi, dokler se niso spremenile v take, kakršne zdaj zopet uničujemo. Vidimo, da sta delovanje sistema klimatskih/podnebnih sprememb in sposobnost posameznikov in družbe, da omejujejo nevarno delovanje sistema klimatskih/podnebnih sprememb med najbolj negotovimi vsebinami našega življenja v prihodnje.

Sistem klimatskih/podnebnih sprememb, ki omogoča, zagotavlja, vzdržuje in ohranja kvaliteto življenskih pogojev biosfere – našega naravnega okolja, ima veliko večji pomen, kot so ljudje mislili v preteklosti. Za biosfero planeta Zemlje oziroma naše naravno okolje ima bistveno nalogo omogočati, zagotavljati, vzdrževati in ohranjati življenske pogoje, katerim se prilagajajo vse oblike življenja na Zemlji. Izginotja mnogo življenskih oblik v preteklosti in sedanjosti so posledice sprememb v življenskih pogojih v njihovem naravnem okolju, katerim se niso mogle prilagoditi. Spremembe življenskih pogojev nastajajo zaradi delovanja sistema klimatskih/podnebnih sprememb, ki so v veliki meri posledica enostranskega obnašanja ljudi.

Biosfera – naše naravno okolje je posledica delovanja sistemov planeta Zemlja, ki to omogočajo na osnovi **medsebojne odvisnosti, medsebojnega delovanja in sodelovanja** (Ećimović, Mulej, Mayur 2002) celotne mase, energije in informacij² v časovnem okviru treh osnov biosfere oziroma našega naravnega okolja vode, zemlje in zraka.

Vsaj ocenjevanje, če že ne preprečevanje rizika posledic, imenovanih stranski učinki kratkoročnega, srednjeročnega in dolgoročnega pomena, bi moralo biti nujen del osnovne ali aplikativne raziskovalne dejavnosti, vendar ni bilo običajen del raziskovanja v času industrijskega in kasnejših obdobj. Niti v poindustrijskemu, informacijskemu, inovacijskemu niti v današnjem globalizacijskem sistemu življenja ljudi na področjih industrijske in kmetijske proizvodnje, sintetičnih kemičnih spojin, denarne demokracije³, individualne in organizacijske družbene odgovornosti, upravljanja tehnologij še niso upoštevale sonaravne oziroma trajnostne vsebine. Nuklearne tehnologije, eksplozijski motorji, transportni sistem in drugi so onesnaževali v nerazumno dolgem času vse tri osnove našega življenja: zemljo, vodo in zrak. Danes je pomembno vprašanje, kdaj in kako bodo škodovali naravnim oblikam življenja vključno z nami. Zelo pomembno za znanost in človeštvo je razumevanje **medsebojne odvisnosti, medsebojnega delovanja in sodelovanja celotne mase, energije in informacij** v okolju, od vesoljskega do okolja Zemlje, biosfere - oziroma v našem življenskem okolju. To naj bi omogočilo napore za doseganje trajnostne/sonaravne prihodnosti človeštva oziroma njegove harmonije z naravo planeta Zemlja. Priporočamo sistemsko razmišljanje in dialektično sistemsko teorijo (Mulej⁴) za odgovorno delo v prihodnje.

Danes posamezniki in družba v praksi uporabljajo naravo, okolje in biosfero oziroma naše življensko okolje kot brezplačno dobroto brez vrednosti. Mislimo, da je to danes bolj zapleteno vprašanje. Spreminjajoča se kvaliteta narave, delovanje in blaženje delovanja sistema klimatskih/podnebnih sprememb narekujejo naše priporočilo za:

- sistemsko razmišljanje z dialektično sistemsko teorijo, ki povezuje delo ljudi in njihovo ustvarjalnost s primerno celostnim razmišljanjem ter omogoča pravilne odločitve in usmeritve v rednem delovanju ter inoviranju,

² Prosimo pogledjte »The Information Theory of Nature, and« Ećimović, 2006, dostopno na domači strani: www.institut-climatechange.si

³ Denarne demokracije ali države z demokratičnimi sistemi, katerih vrhovni poglavar je denar, ki ima tako pomembno vlogo, da ni samo poglavar, ampak je dosegel lastno reprodukcijo in status monstuma (Ećimović 2005).

⁴ Zasl. prof. ddr. Matjaž Mulej, Univerza v Mariboru, med drugimi tudi v knjigi System Thinking and Climate Change System, Ećimovića, Muleja, Mayurja, 2002, dostopni na domači strani: www.institut-climatechange.si



- ustvarjanje celovitejšega odnosa človeštva do narave, posledica bodo boljši pogoji v naravi in sožitje.

Mislimo, da je pomembno, da se poučimo o omejitvah in vplivih delovanja sistema klimatskih/podnebnih sprememb in si izdelamo jasne poglede na posledične spremembe, ki lahko škodljivo delujejo na človeštvo in naravo planeta Zemlje. Predstavili bomo nekatere osnove sistema klimatskih/podnebnih sprememb z namenom, da prispevamo k razumevanju naših priporočil.

Voda, zemlja in zrak kot sistemi biosfere ali našega naravnega okolja so osnova življenja na planetu Zemlja. Danes ni veliko znanstvenikov in raziskovalcev seznanjenih s sistemom delovanja narave na osnovah **medsebojne odvisnosti, medsebojnega delovanja in sodelovanja**. Sodobne raziskave na osnovah systemskega razmišljanja in sistem klimatskih/podnebnih sprememb pomembno vplivajo na poznavanje narave, ki naj bi človeštvu omogočilo boljše razumevanje delovanja človeške globalne skupnosti na biosfero planeta Zemlja - na naš življenski prostor.

Z vidika narave je sistem klimatskih/podnebnih sprememb alias klima oziroma klimatske spremembe niz/sistem/kompleks določil znotraj življenjskega prostora biosfere. V resnici biosfera sama je življenski prostor, ki je le manjši del zemeljskega planetarnega sistema.

Opazovanje klime in vključevanje opazanj v človekove odločitve sta dve povsem ločeni zadevi, posebno v zadnjih stoletjih, ko je industrializacija prevzela vodilno vlogo in sprožila razvoj ozkih profesionalnih specializacij z namenom vladati in prevladovati.

Obstajata dva glavna vzroka klimatskih/podnebnih sprememb: naravni vzroki in vzroki, ki jih je povzročil človek. Poznati bi morali obe vrsti, da bi lahko upoštevali vzroke in eventualno preprečili ali lajšali njihove hude učinke na človeštvo (n.pr. poplave, suše, viharne vetrove, ipd.).

Sisteme (kot kompleksne pojave, ne kot mentalne slike o njih) lahko razdelimo glede na njihovo velikost v:

MAKRO/MEGA/SUPERIORNE/ZELO VELIKE sisteme, kot so vesolje, največji človeštvu znan sistem, rimska cesta, sončni sistem, sistem planeta Zemlja ipd., in

MIKRO/INFERIORNE/MANJŠE/SUB sisteme, ki so manjši in so ali naravni, kot na primer Homo Sapiens, rastlinstvo, živalstvo ali druga živa bitja, ali umetni, ki jih je ustvaril človek, kot so na primer mesta, transportna sredstva itd.

Zgoraj navedeni naravni sistemi in sistemi, ki jih je ustvaril človek, zahtevajo tudi delitev znanosti na tehnične, naravoslovne in socialne vede, od katerih pa nobena ne vključuje vseh človekovih aktivnosti kot integralni del narave. Zato menimo, da ne obstajajo naravni in umetni sistemi, temveč so vsi naravni toliko časa, dokler so rezultat aktivnosti živih bitij. Zavedamo se, da za mnoge lahko dolgo traja, da bodo razumeli tako filozofijo, zato bomo trenutno še uporabljali termine umetni in naravni sistemi.

Sistemska teorija, razmišljanje, analiza in sinteza so danes najboljša pomoč človeštvu za razumevanje zapletenosti problemov, ki jih predstavljajo tako makro, kot mikro sistemi. Ne



obstaja enostavni sistem in ne obstaja sistem, za katerega bi lahko trdili, da o njem vemo vse. To moramo posebno poudariti, ko govorimo o sistemskem razmišljanju, ki razlikuje med razmišljanjem današnjega časa in razmišljanjem jutrišnjega dne.

Izzivi današnjemu človeštvu so mnogo kompleksnejši, kot kdajkoli prej, ker smo ljudje dospeli do nekakšnega kritičnega vrha naših zmožnosti razumeti današnji čas. Dokaz za to je naš odnos do narave, prostora in okolja, ki namesto, da bi bil prijateljski, postaja vedno bolj neprijazen. Antropocentrična filozofija naše civilizacije, njen današnji socialni red, religiozni pristop/vladanje, zaslužkarsko naravnane demokracije, lokalne, nacionalne, internacionalne birokracije in birokracija Združenih narodov, totalitarni režimi, pomanjkanje tolerance med različnimi ljudmi in narodi na zemlji, politika razdeli in vladaj (od antike do danes), kruha in iger, prevlada informacijskega monopola – vse to so organizacijske metode, ki potrebujejo prestrukturiranje/inovacijo za nov – celovitejši – pristop za boljši jutri. Ali bo naša civilizacija imela boljši jutri, ali ne, je vprašanje, na katerega je bolje poiskati odgovor pred njenim zlomom. Bodimo optimisti in verjemimo, da bo jutri naša civilizacija zmogla razumeti naravo, vesolje, okolje, klimatske/podnebne spremembe, kozmos in druge sisteme. To razumevanje bo široko odprlo vrata trajnostni/sonaravni prihodnosti za vse človeštvo na planetu Zemlja.

Trenutno razumevanje klimatskih/podnebnih sprememb je omejeno zaradi antropocentričnih – t.j. le človeku prilagojenih in podrejenih – in drugih pogledov. To bi preprečila uporaba systemske teorije, razmišljanja, analize in sinteze. Omogoča nam boljše razumevanje medsebojnih odvisnosti in učinkov mono-, multi-, inter-, in supra-disciplinarnih problemov kot integralnih delov inferiornih in superiornih sistemov v okviru sistema planeta Zemlje in nadalje v okviru sončnega sistema⁵, sistema rimske ceste in vesolja.

Narava se ne ponavlja, ampak gre vedno le v eno smer: naproti večdimenzionalni dinamični prihodnosti. Smer te evolucije ni znana.

Človeštvo si z vsemi svojimi verovanji in religijami, naravnimi, družbenimi in tehničnimi dosežki, tehnologijami, vladavinami, lokalnimi skupnostmi, družinami in odnosi slej ko prej domišlja, da je božanstvo, ki je poklicano, da vlada naravi, vesolju in okolju biosfere. Ko pride do točke za skupno akcijo, skupen interes in preživetje naše civilizacije, je na razpolago mnogo pripravnih izgovorov za nedejavnost, kot so takoimenovani nacionalni interes, nacionalna varnost, nacionalni blagor ipd. Vendar so vsi ti izgovori le prazne fraze, primerne za ohranitev oblasti in koristi individualnih ali kolektivnih voditeljev oziroma nacionalnih elit. Verjamemo v vlogo vodenja, vendar verjamemo tudi v zmeren stil življenja, ki omogoča daljše življenje, mir in stabilnost, kajti to zahteva narava.

Kako je današnje razumevanje klimatskih/podnebnih sprememb odvisno od človekovega vpliva, lahko najboljše pojasnimo z vlogo politikov in mednarodnih birokracij, ki imajo dovolj finančnih virov za plačevanje znanstvenikov, da pišejo in govore po njihovih željah. Preusmeritev znanstvenih in uporabnih dosežkov ter teoretičnega dela je skoraj nemogoča, dokler pristranski gospodarstveniki, politiki in birokracije upravljajo sredstva. Naučili so se, kako vladati/gospodariti, ne pa, kako ustvariti pogoje za primerno celovit in ne ozko usmerjen razvoj v znanosti in tehnologijah sistema planeta Zemlja. Kako pojasniti fantastičen razvoj

⁵ Govorimo o sistemu, ne o množici. Po teoriji sistemov matematično sestavljata sistem dve množici: množica sestavin in množica odnosov med njimi (in z okoljem). Iz slednjih nastajajo sinergije lastnosti, ki jih ima celoten sistem, sestavine same pa ne. Zato bi govor o množici pomenil, da kot nekoč spregledujemo povezave in njihov bistveni pomen. To povzroča ogromen del sodobnih težav in potreb po dragi obnovi življenjskih pogojev ljudi.



oborožitvene idr. industrije, kemičnih sintetičnih proizvodov, 800 milijonov in več avtov in mnogo več eksplozijskih motorjev (letala, ladje, čolni, poljedelski idr. stroji), transportnih sistemov, k trženju in v ustvarjanje dobička usmerjenih proizvodov, promocijo globalizacije kot orodja za proizvodnjo denarja, medtem ko znanstveniki niso plačani, da bi opravljali bazne raziskave in morajo zanemarjati raziskovalno delo, ki je potrebno za razumevanje pojavov v sistemu biosfere, ki so zaradi dejavnosti človeštva in odgovora sistema klimatskih/podnebnih sprememb in celotne biosfere nevarni naši civilizaciji?

Verjetno je to zato, ker je spregledana
»tragedija skupne lastnine« - zanemarjanje primerne celovitosti.

Sistem klimatskih/podnebnih sprememb je naravni makro sistem, sestavljen iz mnogih med seboj povezanih/delujočih nadrejenih in podrejenih sistemov, in ne reagira le na naše civilizacijske aktivnosti, temveč tudi na pravila drugih sistemov v naravi. Če ne razumemo sistema klimatskih/podnebnih sprememb, je to zaradi nepravilno usmerjenih raziskav/razvoja. To ni povezano z navadnimi ljudmi, temveč z enostransko opredelitvijo družbene ureditve, dobičkonosno usmerjenimi demokracijami in mednarodnimi birokracijami (posebno narodov G7), ki vodijo našo civilizacijo. Primanjkuje jim celostnega razumevanja, zato ustvarjajo pogoje za enostranske človekove aktivnosti.

Vzemimo primer CFC-jev, sintetičnih kemičnih spojin, ki povzročajo razpad ozona, in so jih bolj kot za dobrobit človeštva proizvedli zaradi tržno usmerjenega razvoja in pridobivanja dobička. Pri tem so povzročili, da je klimatski sistem reagiral s svojimi spremembami in grozi s totalnim uničenjem naše civilizacije. Naučiti se moramo, kako upravljati/gospodariti sami s seboj. Res je, da človeštvo ni vedelo o stranskih učinkih CFC-jev, a danes so nam ti znani. Zaradi tega ni več vzrokov za nadaljevanje s prejšnjo prakso uporabe substanc, za katere ne vemo, kako medsebojno delujejo z medijem, kjer se nahajajo, z uporabo tehnologije gensko spremenjenih organizmov, oboroževalne tehnologije, enostranskega razvoja in uporabe novih kemičnih sintetičnih proizvodov in eksplozijskih motorjev, ki so trenutno najnevarnejše aktivnosti naše civilizacije ipd. Ne smemo pozabiti omeniti informacijske tehnologije in tehnologije prenosa energije, ki lahko vplivajo na magnetna polja in temelje zemeljskega ravnovesja.

Od energije in plinov do planetarnih raziskav, to je povzetek razvoja Zemlje od rojstva pa do danes⁶.

Sistem klime/klimatskih/podnebnih sprememb je sistem biosfere, ki omogoča, zagotavlja, vzdržuje in ohranja pogoje za življenje. Kot naravni (pod)sistem je podrejen biosferi, planetu Zemlja, soncu in solarnemu sistemu, sistemu rimske ceste in vesolju. Kasneje si bomo ogledali posamezne sisteme. Sistem klimatskih/podnebnih sprememb ima več podrejenih (pod)sistemov, kot so: atmosfera, morja/oceani, kopno in druga območja, povezana z biosfero. Vsi omenjeni sistemi imajo podrejene (pod)sisteme, ki skupaj tvorijo celovit sistem biosfere. Vse naštetje je potrebno razumeti kot medsebojno odvisne, medsebojno delujoče in sodelujoče gibljive, neodvisne, med seboj delujoče, dialektične in dinamične sisteme, ki se stalno spreminjajo. Smer gibanja je samo dinamična evolucija naprej. Za nezainteresiranega človeka je lahko narava videti kot kaos, vendar je narava, kot je napisal pokojni prof. dr. Helmut Metzner v svojem delu »Chaos to Bios«, lahko videti kot kaos za človeštvo, A tudi dosežke naše civilizacije lahko narava šteje za kaos in ne za red, kot si domišljamo. Primerno celovito znanje in etika naj odločita, kaj je prav, kaj narobe.

⁶ Iz pogleda naše civilizacije.



Sistem klimatskih/podnebnih sprememb je zelo zapleten sistem, ki je medsebojno odvisen, medsebojno delujoč in sodelujoč ter soodvisen s številnimi podrejenimi in nadrejenimi sistemi. Glavni namen sistema klimatskih/podnebnih sprememb je vzdrževanje energetskega ravnovesja, t.j. temperature, sistema ciklusa vlage/vode, sestave troposfere, atmosfere in oceanskih tokov. Mnoge druge podrejene sisteme bomo pojasnili kasneje.

Vsekakor sistema klimatskih/podnebnih sprememb ne moremo pojasniti/razumeti ali raziskovati z znanjem na področju ene ali dveh trenutno znanih znanstvenih disciplin, temveč z znanstvenim raziskovanjem, ki bazira na primerno celovitem multidisciplinarnem, interdisciplinarnem ali celo supradisciplinarnem pristopu, ki ga opravlja skupina znanstvenikov, ki delajo za skupen cilj na sinergijski osnovi. Jasno je, da morajo znanstveniki za kompleksno reševanje problemov delati po principu sistemske teorije, razmišljanja, analize in sinteze, da bi bilo delo pri raziskovanju narave uspešno.

Supradisciplinarnost je pri našem raziskovanju s stališča naravoslovnih ved predpogoj za posameznika, da bi lahko razumel kompleksne probleme kompleksnih sistemov. Za razumevanje delovanja sistema v regularnih pogojih in v pogojih, ki so odvisni od samega sistema ter od superiornih in inferiornih sistemov, ali pa celo soodvisni z njimi zaradi obojesmernega vpliva, kakor tudi za pravilno razumevanje potrebnih raziskav, dela in ukrepanja ima supradisciplinarno delo/raziskovanje prednost pred klasičnimi znanstvenimi disciplinami. Slednje so še vedno uporabne, a za zgolj fazne izide in ob jasnem zavedanju, da so delne in pristranske, dokler se ne povežejo v sinergije z drugimi.

Glavna naloga sistema klimatskih/podnebnih sprememb je omogočanje, zagotavljanje, vzdrževanje in ohranjanje pogojev za življenje znotraj biosfere in zahteva razlago, kaj je življenje. Na osnovi raziskav na področju naravoslovnih znanosti in drugih ugotovitev vidimo, da življenje lahko pojasnimo s hipotezo v naslednji enačbi:

$$\text{ENERGIJA(E)} \times \text{MATERIJA(M)} \times \text{INFORMACIJA(I)} + \text{ČAS(Č)} = \text{ŽIVLJENJE(Ž)}$$

$$E \times M \times I + \check{C} = \check{Z}$$

Pri tem naj bi življenje razumeli kot pojav življenja na planetu Zemlja, ki ima edinstveno sestavo, fiziko, geografijo in biologijo ter neprestano razvija svojo naravno, prostorsko in okoljsko kvaliteto, odseva trenutno stanje sistema in kvaliteto svojih superiornih in inferiornih sistemov. Sestavni del nastanka biosfere je informacija, ki je pri definiciji bistva in oblike specifičnega živega bitja soodvisna z energijo in materijo; izraža vpliv, ki ni niti energetski niti materialni, ampak vsebinski. Primer: zakaj se iz nekega zarodka razvije slon, iz drugega bolha; zakaj iz človeškega zarodka nastanejo vsi organi? Osnovna informacija, povezana s samim življenjem, je v njegovih genetskih strukturah, ki so sestavljene iz štirih aminokislin v različnih kombinacijah v sistemih, specifičnih za vsako posamezno vrsto, za katero so bile sestavljene sočasno (v teku evolucije). Prva informacija o življenju je nastala istočasno s pojavom prve oblike življenja, kasnejše pa so bile refleksija/posledica evolucije.

Življenjski pogoji niso zbirka, temveč prej sistem/bistvo kvalitete okolja biosfere in predpogoj za nastanek/pojav/obstoje življenja. Evolucijska teorija, teorija Gaia, sistemska teorija, znana preteklost in sedanjost ter stanje biosfere potrjujejo zgornjo hipotezo.



Začetek klimatskega/podnebnega sistema in sistema klimatskih/podnebnih sprememb je dinamika planeta Zemlje, njen nastanek in obstoj, kot dela nastanka in obstoja solarnega sistema in kot rezultat dinamike vesolja.

Sistem klimatskih/podnebnih sprememb na planetu Zemlja ne vlada nad živlenskimi pogoji na povelje, temveč z medsebojno odvisnostjo, medsebojnim delovanjem in sodelovanjem ter posledicami sistemske dinamike. Tukaj lahko omenimo vpliv človeka/sedanje civilizacije na sistem klimatskih/podnebnih sprememb, ki jo lahko opišemo kot sprožilca sistemske dinamike zaradi naših aktivnosti. To bomo komentirali kasneje.

5. Kratka zgodovina planeta Zemlja, kot podrejenega sistema vesolja

Planet Zemlja je nastal približno pred 4,5 milijarde let (4.500.000.000). V tistem obdobju je bil planet nekaj kot krogla, skupek energije in plinov s temperaturo okrog 7.000 stopinj celzija. V teku milijonov let se je planet ohlajal in v teku dvesto tisoč milijonov let se je stvorila trdna materija. Najstarejše kamenine na zemlji datirajo izpred 4,3 milijarde let.

Planet Zemlja je inferiorni sistem solarnega sistema, rimske ceste in vesolja.

Vesolje je makro, največji in najbolj zapleten sistem, ki ga človeštvo danes lahko raziskuje. Sestoji se iz vseh vrst materije, svetlobe in drugih oblik sevanja in energije, iz vsega, kar obstoja kjerkoli. Zajema tudi planet Zemljo, vse na njem in znotraj njega ter vse v sončnem sistemu. Naše osončje sestavlja devet večjih planetov in na tisoče kometov in manjših planetov, ki jih imenujemo asteroidi. Središče je sonce, zvezda, okrog katere krožijo planeti.

Če razvrstimo vse informacije o vesolju/naravi kot 100 enot, lahko celotno znanje današnje civilizacije postavimo med prvo in drugo enoto. Raziskati moramo še mnogo več, kot smo do sedaj. Seveda pa ne smemo pozabiti dinamike in razvoja sistemov, kar presega današnje znanje o vesolju. Če razumemo holistično naravo vesolja, lahko razumemo, da je dinamika vesolja prisotna v nešteto oblikah, tranzicijah, ekspanzijah, velikih in malih pokih, pojavih in izginotjih ter v nešteti dogajanjih.

Drugi omejen del vesolja, kjer obstojamo, je rimska cesta. Je naša prva tarča raziskav in sistem, o katerem moramo spoznati kolikor mogoče veliko. Rimsko cesto sestavlja okrog sto milijard in več zvezd v kakršnikoli obliki in nešteto planetov, mikro planetov in asteroidov ter vseh drugih oblik energije, materije, informacij, naravnih sil, svetlobnih in drugih žarkov, in raznih vrst delcev ter še nam nepoznanih vsebin.

Sestava planeta Zemlje znotraj solarnega sistema je edinstvena zaradi materije, energije in informacij ob njenem rojstvu. Vse oblike/vsebine, ki so obstajale v trenutku nastanka, so vključene v sistem planeta Zemlja, kakor tudi mnoge druge oblike in vsebine iz vesolja, kot so energija, materija, informacije, svetlobni in drugi žarki, delčki in še nam neznane vsebine, ki so v teku časa od nastanka pa do danes prišle v stik z njo. Največji vpliv na dinamiko planeta Zemlja prihaja od nenehnega toka energije iz Sonca in od trkov z asteroidi, ki prihajajo iz izvenzemeljskega planetarnega prostora. Potrebno je upoštevati to znanje, ki nam lahko pomaga pri raziskovanju sistema klimatskih/podnebnih sprememb, kajti prvi vpliv na sistem klimatskih/podnebnih sprememb prihaja iz zunanjega vesolja, kot so asteroidi in druge nevarne kolizije, ki so spreminjale in še vedno lahko spreminjajo ravnovesje sistema planeta Zemlja in tudi sistema klimatskih/podnebnih sprememb.



Iz preteklosti se lahko naučimo o številnih vzrokih, na katere je reagirala Zemljina klima z dinamičnimi posledicami za pogoje življenja. Poznamo ledene dobe, ki so bile posledica znižanja temperature kopnega in oceanov. Seveda ne smemo pozabiti, da masa kopnega in masa oceanov reagirata na spremembo povprečne temperature različno. Masa kopnega reagira hitreje od mase slane vode. Posledično je bilo med ledenimi dobami življenje na kopnem (30% zemeljske površine) bolj prizadeto, kot življenje v morju.

6. Medsebojna odvisnost, medsebojno delovanje in sodelovanje narave in življenja, sistema klimatskih/podnebnih sprememb in biosfere oziroma našega naravnega okolja

Medsebojna odvisnost, medsebojno delovanje in sodelovanje narave in življenja, sistema klimatskih ali podnebnih sprememb in biosfere tvori dinamične faktorje za razvoj različnih oblik življenja in posledično za stanje okolja. Prvotna Zemlja je pred kakimi 4,5 milijardami let bila brez življenja in neprepoznavna za naše civilizacijske standarde. Zrak je bil brez kisika in mnogi podsistemi klime, ki jih poznamo danes, niso obstajali. Sam sistem klime pa se je razvijal glede na medsebojno odvisnost, medsebojno delovanje in sodelovanje sistema Zemlje, kakor se razvija še danes.

Začetek življenja na Zemlji odseva pogoje prvobitne narave, okolja in prostora, njene fizikalne in druge vsebine. Za evolucijo/pojav življenja na Zemlji je narava potrebovala približno 0.7 milijarde let. Prvi dokazi življenja datirajo izpred 3.8 milijarde let.

Od pojava mikroorganizmov v primordialni/prvobitni dobi do razvoja kompleksne biosfere pred 1.2 milijardami let je bilo obdobje, ko je evolucija omogočila nastanek biosfere. Posledica prve energetske spremembe biosfere od anaerobne do aerobne proizvodnje energije kot dejavnosti mikroorganizmov je bila sprememba atmosfere iz atmosfere brez kisika v atmosfero, bogato s kisikom. Koncentracija kisika je bila takrat okrog 40% in se je postopoma zniževala na 21%, kakršna je bila ob koncu 19. stoletja.

Pojav kisika je pomenil glavno spremembo življenskih pogojev in predstavlja največjo razliko med biosfero primordialne/pradavne dobe in dobe izpred 1,2 milijarde let do današnje dobe. Koncentracija kisika v zraku, ki ga vdihavajo živa bitja, ne sme pasti pod 8% , kar je nekako minimum za preživetje. Trenutno v nekaterih gosto naseljenih predelih velikih mest koncentracija kisika lahko doseže nekaj nad 10%. Zaradi tega priporočamo monitoring koncentracije kisika kot predpogoj za preživetje ljudi v občutljivih in močno onesnaženih okoljih velikih mest.

Prve nasebine naše civilizacije so nastale približno pred 12.000 leti kot rezultat izboljšanja družbenih pogojev predantičnih ljudi. Prve nasebine v Evropi so zaradi varnosti nastale v močvirnatih predelih s populacijo do 10.000 ljudi. Bile so rezultat spremenjenih pogojev znotraj biosfere, ki so nastali po zadnji ledeni dobi, ki se je končala pred 60.000 do 16.000 leti. Od takrat naprej so bili klimatski pogoji na zemlji skoraj enaki današnjim. Seveda so spremembe obstajale, vendar ne tako ekstremne, kot jih beležimo sedaj. Razlika med današnjim časom in časom izpred 200 let je nastala zaradi ogromnega prispevka tehnologij naše civilizacije v biosfero, kot so n.pr. stranski učinki in odpadki nuklearnih tehnologij, sintetične kemikalije, posledice eksplozije človeške populacije in uničevanje biosfere zaradi



različnih postopkov za zadovoljevanje človekovih potreb. Na kratko (detajlno jih bomo obdelali kasneje), to so vplivi in posledično učinki naše civilizacije na klimatske spremembe.

Sistem klimatskih/podnebnih spremembe je zapleten naravni sistem. Sestoji iz več podsistemov in je obenem tudi podsistem sistemov, kot so sistem planeta Zemlje, solarni sistem, rimska cesta in vesolje. Predstavlja zelo star sistem, ki se nenehno spreminja ter nudi precej stabilne pogoje za vse oblike življenja. V sedanjem klimatskem/podnebnem sistemu se po stoletjih industrializacije in postindustrializacije dogajajo mnogo bolj ekstremne spremembe kot kdajkoli od konca zadnje ledene dobe. Človek ni edini vzrok teh nevarnih procesov, čeprav je eden od zelo pomembnih, še posebno, če naše odločitve in dejanja bazirajo na pomanjkanju systemskega, primerno holističnega razmišljanja.

Sistem klimatskih/podnebnih sprememb je integralni del zemeljske biosfere in se nahaja nekako med njenimi inferiornimi in superiornimi sistemi. Vsi skupaj s sistemom klimatskih ali podnebnih sprememb imajo številne medsebojne odvisnosti, delovanja in sodelovanja.

Kot smo že omenili, vesolje zajema vso materijo, energijo, informacije, svetlobne in druge žarke, naravne sile, razne oblike delcev in še nam nepoznane vsebine in sploh vse. Na zemeljski klimatski/podnebni sistem ima vesolje lahko dramatičen vpliv. V primeru sprememb v solarnem sistemu in v primeru trčenja Zemlje s telesi iz vesolja je lahko ogrožen njen obstoj. Zgodilo se je že in lahko se ponovno zgodi. Obstoja namreč hipoteza, da je trčenje Zemlje s kozmičnim meteoritom pred 65 milijoni let povzročilo izumrtje dinozavrov.

Najsuperiornejši sistem je vesolje, ki predstavlja medsebojno odvisnost, medsebojno delovanje in sodelovanje med vesoljem, rimsko cesto in solarnim sistemom in je največji nam znani sistem. Možnost destruktivnega medsebojnega delovanja med Zemljo in sistemom vesolja je zelo majhna. Ker v vesolju obstaja nešteto ozvezdij in drugih oblik, ima Zemlja malo možnosti, da bi doživela uničenje zaradi aktivnosti sistema vesolja. Zemlja je namreč zelo majhen delček tega sistema.

Solarni sistem je z našega gledišča zelo velik sistem, vendar z galaktičnega gledišča in še bolj z gledišča vseмира zelo majhen. Sonce s svojimi devetimi planeti je majhen subsistem galaksije rimske ceste. Dejansko ima galaksija rimske ceste sto milijard in več zvezdnih sistemov in naš sončni sistem je le eden od njih.

Sonce je centralna zvezda sončnega sistema in ima 99,8% mase celotnega sistema. Je center svojega sistema in izvor vse materije, energije in informacij znotraj njega. Seveda je inferioren sistem napram rimski cesti, ki je po materiji 100.000 milijard krat večja od solarnega sistema. Sončni sistem kroži okrog centra galaksije rimske ceste s hitrostjo okrog 250 km na sekundo.

Za zemeljski planetarni sistem je Sonce izvor vsega od rojstva naprej in mi obstajamo, ker nas Sonce oskrbuje z energijo, toploto, svetlobo in z vsem potrebnim. Naš planetarni sistem je v celoti odvisen od Sonca. Naša sedanjost je odraz fizikalnih, bioloških in drugih stanj, v katerih se nahaja v tem trenutku.

Seveda vpliv sončnega sistema ne izvira le iz Sonca, temveč tudi iz medsebojnih odvisnosti, medsebojnega delovanja in sodelovanja celotnega sistema, sistemov sosednjih planetov, planetom podobnih teles različnih velikosti, meseca in drugih oblik energije, materije in naravnih sil. Planet, najbližji Soncu, je Venera, oddaljenejši pa Mars. Skupaj z Merkurjem



predstavljajo trdne planete solarnega sistema. Drugi štirje planeti Jupiter, Saturn, Uran in Neptun so gigantski planeti v plinastem stanju na obrobju našega sončnega sistema. Zadnji planet Pluton ni vedno zadnji zaradi svoje ovalne orbite, ki ga včasih postavi pred Neptun, čeprav je večino časa najbolj oddaljen od Sonca.⁷

Sončni sistem je stabilen in spremembe znotraj samega sistema se odražajo na celotnem sistemu. Najpomembnejši deli sistema so energetske tokovi od Sonca do planetov in kvaliteta posameznih planetarnih sistemov. Ne le sestava, temveč tudi oddaljenost planeta od Sonca sta faktorja, odločilna za kvaliteto solarnega sistema. Svetloba in toplotni žarki iz Sonca omogočajo življenje na Zemlji. Kvaliteta sončnega sistema, edinstvena sestava in oddaljenost Zemlje od Sonca so medsebojno odvisni, medsebojno delujoči in sodelujoči deli lastnosti, ki omogočajo življenje na Zemlji.

Razumevanje mnogih neznanih sil v naravi, kot so magnetizem, energija, transformacija materije, radiacija, vloga delcev in podobnega, gibanje sončnega sistema (kot vrtavka, orbitalno, galaktično, vesoljsko), Sonca in planetov vključno z Zemljo, je pomembno. Zato je mogoče sklepati na značilnosti, medsebojno odvisnost, medsebojno delovanje in sodelovanje ter aktivnosti celotnega sistema.

Premer Sonca je 109 krat večji od premera Zemlje in 400 krat večji od premera Meseca. Vseh devet planetov in drugih oblik znotraj sončnega sistema kroži okrog Sonca. Sonce in vsi planeti se gibljejo kot vrtavke in skupaj krožijo znotraj rimske ceste. Vse to gibanje je potrebno natančneje raziskati, da bi lahko razumeli osnovne sile, ki so posledica medsebojne odvisnosti, medsebojnega delovanja in sodelovanja med posameznimi deli sončnega sistema in celotnega vesolja. Sončni sistem deluje glede na obstoječe sisteme tako kot vsi drugi sistemi; naša civilizacija ima možnost raziskovati in razumeti naravo ter naš obstoj.

7. Sistem planeta Zemlja

Zemeljski planetarni sistem je zelo mogočen. Trenutno znaša premer notranjega jedra 2400 km. Sestavljeno je iz železa in težkih kovin. Premer zunanjega jedra znaša 2300 km, spodnjega plašča 2300 km, zgornjega plašča 650 km in skorje 3 – 72 km.

Na površju zemeljske skorje se dogajajo neprestane spremembe. Povzročajo jih naravne sile, ki so omogočile tudi nastanek in obliko zemeljske površine. Atmosfera prekriva, ščiti ter zaključuje biosfero planeta do 1000 km višine, kjer se eksosfera končuje v vesolje. Glavni podsistemi Zemlje so njena planetarna masa, njena luna in atmosfera. Premer planeta znaša 7700 km. Po velikosti je Zemlja peti največji planet po premeru, največji je Jupiter z enajstkrat večjim premerom, najmanjši pa Pluton s približno eno petino manjšim premerom od premera Zemlje.

Površina Zemlje skupaj z atmosfero tvori njeno biosfero, kjer živimo in kjer je bilo življenje njen sestavni del več kot 3.8 milijarde let. V tedanje obdobje namreč lahko postavimo prvi pojav mikroorganizmov.

⁷ Pojem planetov po vsebini in izrazoslovlju se spreminja. Sedaj se omenja 11 planetov ali 8 glede na velikost teh in naše pojmovanje. Za vsebino tega prispevka mislimo, da je v redu, da se navajajo planeti kot so bili sredi 20. stoletja.



Med dejavniki, ki omogočajo življenje na Zemlji, je najpomembnejši dejavnik kisik, ki se pojavlja v življenjskem okolju oziroma biosferi in sicer:

- dva anorganska oksida – vodo in ogljikov dioksid, ki omogočata življenje,
- atmosfero s kisikovimi molekulami v zraku, ki ga dihamo, in
- ozonski plašč kot zaščito pred UV žarki.

Ko so bili razviti ti pogoji v sistemu biosfere, je bil pojav življenja le še vprašanje časa.

Zunanji del podpore za nastanek življenja na Zemlji je tok svetlobe in toplote, ki prihaja od Sonca, kar omogoča primerna oddaljenost Zemlje od Sonca. Primerna oddaljenost od Sonca je pomembna, kar potrjujeta sosednja planeta Venera in Mars, ki nimata pogojev za življenje, kot so na naši Zemlji.

Edinstvena sestava planeta Zemlja in njegova oddaljenost od Sonca sta dve kvaliteti, ki sta se razvili v teku nastanka in razvoja solarnega sistema in predstavljata dva ključna pogoja za nastanek življenja na Zemlji.

Površino zemeljske skorje trenutno pokriva okrog 30% kopnega in okrog 70% oceanov in morij. Razmerje med oceani in kopnim se je spreminjalo z dinamičnimi spremembami pri oblikovanju zemeljskega površja. Prvi pojav vode na Zemlji je bil odločilen za nastanek njene površine in atmosfere. Po ohladitvi je bila atmosfera gosta in mnogo tanjša, kot je danes.

Primordialna/prvobitna atmosfera je bila brez kisika. Veliko spremembo je pomenil pojav prvih oblik življenja, ki so bili anaerobni mikroorganizmi, ki za življenje niso potrebovali kisika. Vodik, potreben za sintezo različnih organskih ogljikovih spojin, so črpali iz raztopljenih anorganskih ogljikovih spojin. Za spremembo primordialne Zemlje in njene anaerobne faze v aerobno je bilo potrebnih več sto milijonov let. Pomemben faktor pri tem razvoju je bil padec koncentracije ogljikovega dioksida, ko so mrtve celice sedimentirale na dno oceanov, kjer so se pretvorile v številne ogljikove spojine, kar danes predstavljajo fosilna goriva. Bil je čas prve energetske transformacije, ko so bili mikroorganizmi sposobni pretvoriti molekule sladkorja v dve enoti energije na molekulo.

V naslednjih generacijah so bili mikroorganizmi sposobni s pomočjo sončne svetlobe razcepiti molekule vode in izkoristiti sproščeni vodik za redukcijo molekul ogljikovega dioksida. S pomočjo te fotosinteze je bila proizvedena bogata biomasa. Končni produkt teh reakcij je bil kisik, ki je bil za obstoječe oblike življenja strupen. Popolnoma je spremenil življenje in nove generacije mikroorganizmov so bile sposobne z dihanjem izkoriščati kisik s pomočjo oksidacije biomase. To je bila prva energetska tranzicija na Zemlji, kajti s tako pretvorbo molekul sladkorja je bilo pridobljeno 36 enot energije oziroma 18 krat več kot pri anaerobnih mikroorganizmih.

Zaradi svoje topnosti je bil ogljikov dioksid del vode, medtem ko kisik ni topen v vodi in je postal integralni del atmosfere. Koncentracija kisika v atmosferi se je zviševala in spreminjala ter se ustalila pri 21%. 78% je predstavljal dušik, preostali 1% pa ogljikov dioksid, metan in nekateri drugi plini. S pojavom kisika v atmosferi in pod vplivom sončne radiacije so se kisikove molekule cepile na elementarni kisik, ki se je v zgornji plasti atmosfere pretvarjal v trivalentno molekulo kisika - ozon. Sčasoma je ozon ustvaril za UV žarke nepropustno plast, zaščitni ozonski plašč zoper tisti spekter žarkov iz Sonca, ki so bili bistveni za razgradnjo dioksidnih molekul – UV žarki.



Biosfera na Zemlji je reagirala z bohotnim razvojem življenja, z njegovo razširjenostjo in s prehodom življenja iz vode na kopno. Bakterijsko življenje je s prehodom na kopno ustvarilo na površju z ogljikom bogato plast, kar se je sčasoma spremenilo v to, kar danes imenujemo prst. Zemeljski sistem se je razvil do take stopnje, da so se lahko pojavile tudi bolj kompleksne oblike življenja. To se je dogajalo pred približno 700 milijoni let. Kopenski sesalci so se pojavili pred približno 350 milijoni let, predhodniki človeka pred približno 8 milijoni let, Homo Sapiens pa pred kakimi 100.000 leti.

Tukaj smo torej. Imamo vesolje, rimsko cesto, sončni sistem, sistem planeta Zemlja, življenje na kopnem in v vodi ter atmosfero. Z obstoječimi vplivi superiornih sistemov, posebno sončnega sistema, in s posameznimi deli zemeljskega sistema je nastal sistem klimatskih ali podnebnih sprememb, ki omogoča, zagotavlja, vzdržuje in ohranja kvaliteto življenjskih pogojev znotraj biosfere.

8. Potreba celostno/sistemsko razmišljati kot osnovni princip razumevanja sistema klimatskih/podnebnih sprememb

Opisana dejstva ne pomenijo, da človeštvo nima nobenega vpliva na klimatske spremembe. Imamo ga in njegova vsebina je odvisna od našega razmišljanja in obnašanja. Naša enostranskost je popolnoma naravna in istočasno enako nevarna, ker sčasoma lahko vodi do našega izumrtja. Bolje, da nekaj dodamo, to je holistično sistemsko razmišljanje: tabela 1.

Sistemsko / celovito razmišljanje	Nesistemsko / enostransko razmišljanje
1. Soodvisnost/i, odnos/i, odprtost, dialektični sistem vidikov	Neodvisnost, odvisnost, zaprtost, posamičen vidik
2. Kompleksnost (in tudi kompliciranost)	Poenostavljenost, kompliciranost, deli sami
3. Atraktorji, vplivne sile (zato odnosi)	Izolacija, nič vplivnih sil (zato nič odnosov)
4. Emergenca, emergiranje (zato sinergija)	Nič procesov, ki ustvarjajo nove lastnosti
5. Sinergija, sistem, hierarhija sistemov	Nič novih lastnosti na osnovi odnosov
6. Celota in celovitost, medstrokovnost	Samo deli in lastnosti delov, enostrokovnost
7. Omrežje, medsebojni vplivi (strok, ..)	Nič medsebojnih vplivov (strok, ..)

Tabela 1: Povzetek osnovnih lastnosti systemskega razmišljanja

Sistem klimatskih/podnebnih sprememb je sestavni del zemeljske biosfere. Ni jasno začrtanih meja z drugimi sistemi in naravo, kakor mi ljudje radi mislimo in vidimo. Sistem klimatskih ali podnebnih sprememb je del zapletenega naravnega sistema, ki aktivno jemlje, uporablja, dodaja, vpliva, sodeluje z vsemi superiornimi in inferiornimi sistemi, in odseva trenutno stanje življenjskih pogojev. Opazovalec gre lahko nazaj v preteklost v zgodovino razvoja, ne more pa iti v prihodnost zaradi nešteti možnih vplivov.

Razliko med tradicionalnim razmišljanjem in sistemskim razmišljanjem o klimatskih spremembah lahko opišemo na sledečem primeru. Če opazovalec gleda na dosežke naše civilizacije z vidika gradbene dediščine, je videti vse lepo in prav. Linije so geometrično opredeljene in celotna konstrukcija je videti kot tradicionalen, stilen in arhitekturni dosežek. Seveda pravilo ne velja sto odstotno, kajti veliki katalonski arhitekt Gaudi je na primer predstavil svoj inovativen pristop h gradnji cerkva in drugih konstrukcij. Tudi naša bivališča,



zunanja in notranja oprema, kmetijske dejavnosti, komunikacije, ceste in železnice ipd. sledijo nekemu redu, ki ni videti tak kot nedotaknjena narava. Nam ljudem današnje civilizacije je nedotaknjena narava videti kot kaos in pri tem nismo sposobni videti, da narava na nas gleda obratno. Težko je pojasniti, ali je razlika med naravo in človekovim načinom življenja velika ali majhna, jasno pa je, da je človek povzročil mnogo različnih posegov, ki niso naravni. Za to je razlog konvencionalni način razmišljanja, da je kaos narave kaos, naš način razmišljanja pa je red. Po drugi strani pa nam sistemska teorija razmišljanja omogoča, da vidimo kaos narave kot red in človeški red kot vrsto kaosa. Ko bodo tudi povprečni ljudje v lokalnih skupnostih, ne le znanstveniki, sposobni razmišljati na tak način, bomo imeli mnogo več od kontakta z naravo, kot imamo sedaj.

Če prenesemo zgornja razmišljanja na sistem klimatskih/podnebnih sprememb, lahko razumemo »kaos« kot medsebojno odvisnost, medsebojno delovanje in sodelovanje kot vpliv ter delovanje mnogih različnih naravnih sistemov, ki so deli zelo zapletenega sistema klimatskih/podnebnih sprememb. Pri tem ne smemo pozabiti, da je tako razmišljanje razmišljanje ljudi z vsemi njihovimi dobrimi in slabimi lastnostmi.

Klimatske/podnebne spremembe so zbirka stalne evolucije narave, ki podpira biosfero kot prostor za živa bitja znotraj narave. Videli smo odvisnost sistema klimatskih/podnebnih sprememb od superiornih sistemov, zato naj najprej naštejemo vplive, ki jih imajo na biosfero.

Vse spremembe v sončnem sistemu zagotovo imajo vpliv na biosfero. Na Zemljo imajo močan vpliv in če se pojavijo, bodo za Zemljo lahko usodne. Za boljše razumevanje vplivov Sonca na našo biosfero je potrebno več znanstvenega dela. Kot glavni dobavitelj toplote in svetlobe ima Sonce velik vpliv na biosfero. Velik vpliv ima tudi razmerje med Mesecem in Zemljo.

Na našo biosfero so v preteklosti že vplivali in v prihodnosti tudi še bodo meteorji in meteoriti iz vesolja, rimska cesta, sončni sistem, kakor tudi druge oblike materije, energije, informacij delcev in žarkov ter naravne sile in sistemi, ki jih niti še ne poznamo.

Lastnosti planeta Zemlje, ki jih proučujejo fizika, geografija, biologija, imajo osrednjo vlogo. Zaradi neprestanega medsebojne odvisnosti, medsebojnega delovanja in sodelovanja so naravne sile ustvarile našo biosfero, ki jo tudi vzdržujejo. Človeštvo lahko vidi njeno preteklost in sedanjost, lahko razumemo dinamiko nekaterih omenjenih sistemov/sil, vendar ne vseh. Naše trenutno znanje nima dovolj sistemskega razmišljanja, da bi bolje razumeli sistemske soodvisnosti in dinamiko.

Notranje zemeljsko jedro ima premer okrog 2400 km in se giblje kot vrtavka z drugačno hitrostjo, kot drugi deli planeta. Vsaka sprememba v vrtenju in smeri gibanja ima lahko močan vpliv na zemeljski sistem. Potrebno je več raziskav, da bi lahko razumeli ta podsistem ter njegovo soodvisnost z drugimi sistemi.

Ostala Zemlja, zunanje jedro, spodnji in zgornji plašč ter skorja, ki predstavljajo okrog 7600 km v premeru, imajo številne medsebojne vplive, ki vplivajo na biosfero. Nenehne spremembe Zemlje povzročajo premike površja v plošče, ki se zaradi notranjih sil neprestano gibljejo druga proti drugi. Vulkanski izbruhi in potresi so posledice velikih premikov teh plošč, trkov ali ločevanja. Obe aktivnosti imata kompleksen vpliv na našo biosfero, od direktnih lokalnih katastrofalnih učinkov lave, pepela in premikov tal, do obsežnejših vplivov



v primerih močnih erupcij in velikih količin pepela v atmosferi. V tem primeru vplivajo na celotno biosfero.

Naravne sile, kot so gravitacija, magnetne sile, elektrika, krožno gibanje, vrtenje kot vrtavka in skupno kroženje znotraj solarnega sistema, rimske ceste in vesolja, so zelo pomembne, vendar jih naša civilizacija še ne pozna v celoti.

Sistem klimatskih/podnebnih sprememb je sistem, ki omogoča, zagotavlja, vzdržuje in ohranja pogoje življenja znotraj naše biosfere, ki ga sestavljajo številni sistemi, ki so medsebojno odvisni, delujoči in sodelujoči pri ustvarjanju sedanjih pogojev. Če razmišljamo globalno, lahko sistem klimatskih/podnebnih sprememb opazujemo na posameznih vzorcih ali razlikah, ki prikazujejo različne vrednosti temperature, vlage in tokov.

Biosfero sestavljajo kopno, voda in atmosfera. Značilnosti teh sistemov so osnovni okviri, znotraj katerih sistem klimatskih/podnebnih sprememb omogoča, zagotavlja, vzdržuje in ohranja pogoje življenja, katerim naj bi se vse vrste življenja prilagajale.

Dobro znana geografska dejstva zemljepisna dolžina, širina in višina pogojujejo toploto in svetlobo, kar se odraža v kvaliteti lokalnega okolja. Po drugi strani pa je distribucija teh kvalitet odvisna od karakteristike zemlje in vodnega okolja. Seveda je kvaliteta okolja bolj zapletena na mejah, kjer se različna okolja stikajo. Ni enostavno, če upoštevamo še zapleteno medsebojno odvisnost, delovanje in sodelovanje različnih sistemov, ki kakorkoli vplivajo na sistem klimatskih/podnebnih sprememb.

Iz izbranih tem je najbolj pomemben vpliv na biosfero življenje na Zemlji. Kakor hitro je bila primordialna Zemlja pripravljena gostiti življenje, se je to pojavilo. Prvo, ki je kasneje vplivalo na poznejše bivanje, je bilo anaerobno življenje mikroorganizmov v oceanih. Zaradi izjemnega bogastva oceanskih voda, ki so bile polne anorganskih spojin, so imele prve bakterijske celice odlične pogoje za življenje. Oceanske vode so jih ščitile pred UV žarki, imele pa so tudi primerno temperaturo. Sončna svetloba in toplota sta imeli nižje radiacijske vrednosti, kot danes. Anaerobno življenje ali življenje brez kisika je obstajalo od prvih začetkov do približno 3.8 milijarde let. Takrat, pred približno dvema milijardama let, se je v atmosferi pojavil kisik. Bakterije so zemeljsko biosfero spremenile iz biosfere brez kisika v biosfero, bogato s kisikom, ki je bila nezaščitena pred UV žarki, in v biosfero z ozonsko zaščitno plastjo pred UV žarki. Sterilno kopno se je spremenilo v zemljo, bogato z življenjem. S spremembo anaerobnega v aerobno življenje se je biosfera spremenila in razvile so se mnoge kompleksnejše oblike življenja. Vodni cikel, kisikov cikel, cikel ogljikovega dioksida, cikel žvepla in odpadnih organskih snovi skupaj z življenjem samim so bili sestavni deli biosferskega okolja. Najpomembnejša je bila sprememba sterilnega okolja v okolje, primerno za življenje. Rezultat je bila zaščita zemeljskega površja pred korozijo in drugimi rednimi ali občasnimi pojavi, kot so uničevanje prsti, spreminjanja oceanskih tokov in gibanja zraka. Biosfera se je razvijala in postala življenjski prostor za živa bitja. Fizikalne, geografske, kemične in sistemske soodvisnosti, delovanje in sodelovanje so zagotavljale možnosti za razvoj življenja, ki je podpiralo okolje. Še danes najdemo znotraj zemeljske biosfere tako primordialne/pradavne pogoje, kakor tudi pogoje kasnejše evolucije, ki je sledila. Naša sedanja biosfera ima številne subsisteme, ki z medsebojnim dopolnjevanjem zagotavljajo kontinuiteto življenja v trenutnem in drugih možnih in spremenjenih okoljih.

Kopno, od zaledenelega arktičnega/antarktičnega okolja do tropskih predelov, je prebivališče velikega števila različnih živih bitij, ki imajo skupaj udobno življenje toliko časa, dokler



sledijo sistemski soodvisnosti, medsebojnemu delovanju in sodelovanju. Vse ekološke razlike so del vzdrževanja izmenjave materije v okolju, kjer se je razvilo nešteto biosferskih subsistemov, ki so vključeni v nadaljevanje življenja. Spremembe in razvoj so posledica medsebojnih delovanj, učinkov in sodelovanja vseh sistemov. Enako velja tudi za vodno in atmosfersko okolje. ***Biološki sistem uravnava pogoje življenja znotraj biosfere.***

Sonce nas oskrbuje s svetlobno in toplotno energijo. Zaščitna sistema Zemlje sta ozonska zaščitna plast v stratosferi (15-24 km) in učinek tople grede (naravni deli tega učinka so ogljikov dioksid, metan in dušikov oksid). Oba sistema filtrirata/transportirata radiacijsko energijo na površino Zemlje in nazaj v vesolje. Na zemlji je trenutno 30% kopnega in 70% vodnih površin (oceani, jezera). Razmerje energije predstavlja vnos in oddaja energije. Sprememba pri vnosu in oddaji znotraj energetske bilance predstavlja ogrevanje ali ohlajanje. Vendar reakcija ogrevanja in ohlajanja zaradi raznovrstnosti pogojev na Zemlji, kot so spremembe v atmosferi, na kopnem in v vodi, spremembe v biologiji površja ter antropogeni vplivi, ni vedno enaka. Gibanje zraka in oceanski tokovi dodatno vplivajo na to zapletenost.

Ravnotežje energije je najpomembnejši sistem za ohranitev življenja. Spremembe ravnotežja delujejo uničevalno na biologijo naše biosfere. Rezultat so izumiranje živalskih, rastlinskih in bakterijskih vrst ter pojavljanje novih oblik življenja. Drastične spremembe so znane kot pojav ledenih dob. V preteklosti je Zemlja doživela več ledenih dob⁸.

9. Krog vode – pomebna vsebina sistema klimatskih/podnebnih sprememb

Vodni cikel predstavlja eno od razlik med planetom Zemlja in drugimi planeti istega osončja Marsom, Venero in Merkurjem. Je del biosfere in je bil ustvarjen ob rojstvu Zemlje. Vodni cikel je subsistem biosfere, ki predstavlja kvalitetno in kvantitetno osnovo njenega okolja. Po rojstvu Zemlje se je takoj po ohladitvi pojavila voda v tekočem, trdnem in plinastem stanju; vodni cikel je začel svoje pomembno delovanje/oblikovanje. Kot okolje ima voda odlične sposobnosti transporta in izjemne možnosti medsebojne odvisnosti, medsebojnega delovanja in sodelovanja različnih spojin ter je verjetno skupaj z drugimi sistemi, kot so sestavljanje in gibanje oblakov, bliskanje in naravna elektrika, sodelovala pri nastanku življenja. Življenje se je pojavilo v vodnem okolju in je potrebovalo skoraj dve milijardi let, da se je iz morja/vode preselilo na kopno. Na Zemlji je 97.3% vode v oceanih in morjih, 2.1% vezane v ledenikih, 0.6% v vodotokih in jezerih. Zanemarljive količine pa predstavlja voda v živih bitjih in vlažnosti zemlje. Navzlic temu je voda nujen del biosfere, ki je bil pogoj za nastanek življenja. V telesih živih bitij je 75-95% vode in več. Voda je glavni transportni sistem znotraj celic, tkiv in teles. Voda je glavno okolje za kemične procese v naravi. Voda je glavni arhitekt narave za oblikovanje gorstev, jezer, rek in oblikovanje površja.

ŽIVLJENJE IN VODA,
VODA IN ŽIVLJENJE,
ŽIVLJENJE,
VODA.

⁸ Preglednico ledenih dob in še katere risane predstavitve delov sistema klimatskih/podnebnih sprememb lahko vidite v »Atlasu« na www.institut-climatechange.si



(Iz knjige Ećimović/Jan/Vrhovšek, »Slovenija včeraj, danes in jutri, gospodarjenje z vodo, izziv Slovincem v tretjem tisočletju«, Ljubljana, 1998.)

Gibanje vode/tokove v oceanih in morjih povzročajo razlike v temperaturi in slanosti morske vode, pasatni vetrovi ter vpliv in delovanje drugih sistemov Zemlje (gravitacija, gibanje Zemlje in zraka, ravnotežje energije, gravitacija Meseca in Sonca itd.).

Voda in zrak stalno medsebojno delujeta in sodelujeta, ko se voda spreminja iz tekočega v plinasto stanje. Hlapi se prenašajo po zraku. Pri spremembi temperature in s pomočjo zračnih delcev (fizikalnih ali biotskih) se hlapi spremenijo v trdno in tekoče stanje in pridejo na zemeljsko površino v obliki padavin. Gorovja so vodni stolpi kopnega, gozdovi pa so primarni vodni filter in njen transportni sistem v podzemlje. Vodotoki prenašajo vodo na nižje ležeča območja in skupaj z biološkim sistemom predstavljajo sekundarni vodni filter. Reke so tudi glavni transportni sistem za prenos mineralnih sestavin iz gora in višje ležečih območij v nižine in na koncu v morje.

Če vode iz višjih leg ne najdejo svojih poti na nižja območja, nastanejo jezera, ki s svojim biotskim življenjem predstavljajo jezerski vodni sistem. Seveda imajo jezera lahko svoj rečni dotok in iztok, vendar je glavnina jezerske vode pod nivojem iztoka. Jezera so višje ležeči rezervoarji vode.

Močvirja, močvirni gozdovi in močvirna območja so najboljši biotski filtri vode. Običajno so na nižje ležečih področjih in kot estuariji. Povsod, kjer se stikata voda (slana ali sladka) in kopno, so biološko najbogatejša območja. Izmenjava snovi na planetu Zemlja je možna zaradi aktivne transportne vloge vode in zaradi aktivnosti biološko bogatega okolja, ki skrbi za naše zdravje s prečiščevanjem površinskih kopenskih voda.

Podzemeljske vode transportirajo vodo pod zemeljsko površino in zagotavljajo vodo v vodnih izvirih. Obstajajo velike podzemeljske vode v globinah pod kopnim in pod dnom oceanov/morij, ki so nastale tam zaradi premikov zemeljske skorje. Obstajajo podzemna jezera, ki so bogata z minerali in običajno sterilna.

Gibanje površinskih voda je rezultat višine in gravitacije. Voda ima zlata vredno lastnost, da se giblje navzdol (gravitacija), v mirujočem stanju pa ima ravno površino.

Kopenske, biološke in atmosferske vode predstavljajo manj kot 1% vode na zemlji, vendar so, zaradi vodnega ciklusa, zelo pomemben subsistem biosfere.

10. Zrak in atmosfera - še ena pomembna vsebina sistema klimatskih ali podnebnih sprememb

Med Zemljo in vesoljem je do višine 1.000 km obsežno območje plinov, žarkov, delcev in naravnih sil, ki ga imenujemo atmosfera. Prvih 10-15 km imenujemo troposfera, spodnji del atmosfere. To je področje, ki vpliva na vreme, ker ima najmočnejše gibanje zraka. Tukaj se formirajo in premikajo oblaki, tukaj lahko tudi najdemo živa bitja, od ptic do mikro-organizmov. Troposfera prehaja v stratosfero, ki sega 15-50 km od zemeljske površine in vključuje ozonski plašč (15-24 km). Mezosfera (50-85 km) in termosfera (85-400 km) prehajata v eksosfero, ki se izteka v vesolje pri približno 1.000 km.



Atmosfera, plinasto pokrivalo zemeljske površine, je sestavni del biosfere in celotnega sistema planeta Zemlje. Sprejema, prenaša, odbija, ustvarja obroč okrog zemeljske površine za sončne žarke, svetlobo in toploto, kakor tudi za žarke, delce, telesa iz vesolja in naravne sile, s katerimi pride v stik planet Zemlja kot celota.

99% atmosfere tvorita dva glavna plina: dušik 78% in kisik 21%. Kot vse v naravi, se njuna porazdelitev, gibanje in koncentracija spreminjata v omejenih okvirih. Preostali 1% predstavljajo ogljikov dioksid, metan, vodni hlapi, dušikovi oksidi, argon in drugi plini. Kisik je prisoten kot dioksid, ozon, ogljikov dioksid in vodni hlapi. Kot dodatek so kot prispevek naše civilizacije prisotne dodatne količine ogljikovega dioksida, dodatne količine metana, dušikovih oksidov, klorofluorogljikov, hidrofluorogljikov, perfluorogljikov kot plinov tople grede. Pomembni fotokemični plini, ki indirektno doprinašajo k učinku tople grede, so ogljikov monoksid, dušikovi oksidi in nemetanske hlapljive organske spojine (NMVOC).

Katalitična razgradnja ozona v stratosferi kaže na nekatere splošne reakcije v stratosferi.

Atmosfera je največji del biosfere. Ima pomembno vlogo, ker zaradi vsebnosti kisika omogoča življenje, kajti kisik je plin, ki vzdržuje življenje. Po drugi strani je atmosfera medij za transport vodnih hlapov, nastajanje oblakov in glavni prenašalec v vodnem ciklusu, ki je važen iz vidika biologije. Gibanje zraka v multidimenzionalnem prostoru je regularno ali iregularno. Trenutno lahko v sklopu delovanja sistema klimatskih/podnebnih sprememb beležimo ekstremne premike zraka. Za biosfero je gibanje zraka pomembno zaradi prenašanja oblik življenja, preskrbe z vlago in sestavljanja lokalnih vremenskih razmer. Po drugi strani je gibanje zraka sovražno do človekovih konstrukcij, ki jih uničuje, če so zgrajene s prenizkimi standardi glede na jakost vetrov/tornadov/tajfunov.

Ogljikov cikel je bil verjetno najpomembnejši v primordialnem/pradavnem zemeljskem obdobju, ker je vplival na nastanek zemeljske skorje in na tvorbo depozitov ogljikovega ciklusa na oceanskem/morskem dnu in na zemeljskem površju. Je direkten proizvod bioloških in deloma kemijskih procesov biosfere.

Ogljik je gradbeni element biosfere. Izmenjava ogljika znotraj življenja rastlin je zelo hitra (manj kot 1 leto). Če govorimo o hitri izmenjavi ogljika, je danes na prvem mestu druga izmenjava ogljika. Hitra izmenjava ogljika (1-10 let) poteka v prsti in na površini oceanov in morij, počasna (10-100 let) pa v gozdovih. Zelo počasna izmenjava ogljika (več kot 100 let) je v biosferi pomembna zaradi nalaganja ogljika s pomočjo delovanja mikroorganizmov in zaradi nalaganja sedimentov v obliki kalcijevega karbonata. Zaradi relativno počasnega ogljikovega ciklusa v naravi in zaradi relativno hitrega dodajanja ogljika v biosfero z delovanjem naše civilizacije smo v situaciji, ki je obstoječi naravni sistemi ne morejo kompenzirati. To je eden od razlogov za globalno ogrevanje.

Žveplov cikel je bil v času, ko naše civilizacije še ni bilo, manj pomemben cikel. Ima sicer svojo vlogo v naravi, vendar naša civilizacija oddaja v naravo tako velike količine žvepla, da postaja že škodljiv faktor (kisli dež). Žveplo je sicer esencialni element za življenje na Zemlji. Tudi glede njega se obnašamo premalo celovito.



11. Naša civilizacija kot motnja v delovanju sistema klimatskih/podnebnih sprememb

Naj bo inferioren ali superioren sistem biosfere, planeta Zemlje, solarnega sistema ali vesolja, je naša civilizacija majhen, toda kljub temu vpliven sestavni del vsega skupaj. Danes govorimo o naših problemih zaščite narave, prostora in okolja. Zaščite pred kom? Že veliki grški filozof Platon je pred več kot 2.000 leti zapisal:

» Če bi v gorah Atike še rastle gozdovi, bi bogata prst sprejela vodo in jo skladiščila, tako da bi se absorbirana količina postopoma razpošiljala iz višin in napajala studence. Vendar je sedaj bogata zemlja izprana in obstaja le še nerodoviten okvir pokrajine, ki ga lahko primerjamo s skeletom bolnega telesa.«

Ljudje nismo pravilno imenovali sistemov za pomembne in nepomembne, kajti vsi so sistemi, ki so medsebojno odvisni, medsebojno delujejo in sodelujejo in na ta način ustvarjajo pogoje, ki so danes vidni v biosferi. Toda človeštvo doslej ni sledilo navodilom narave, naj upošteva medsebojno odvisnost, medsebojno delovanje in sodelovanje. Dialektična teorija sistemov, o kateri se da brati tudi v knjigi »Sistemsko razmišljanje in sistem klimatskih sprememb«⁹, ponuja bolj vzpodbudne možnosti, kot splošna sistemska teorija.

Sistem klimatskih/podnebnih sprememb kot integralni del zemeljske biosfere ima večji vpliv na našo civilizacijo kot ljudje verjamemo ali mislimo. V absolutnem smislu nam sistem klimatskih/podnebnih sprememb, ki omogoča, zagotavlja, vzdržuje in ohranja življenske pogoje, omogoča življenje. Vendar mi ljudje s svojim modernim odnosom do narave in drug do drugega ne spoštujemo teh dejstev in poskušamo vse, da bi kolikor mogoče škodovali sistemu klimatskih/podnebnih sprememb, čeprav na srečo še vedno ne toliko, kot bi se dalo.

Obstaja teorija človekovega vmešavanja v sistem klimatskih/podnebnih sprememb, ki poskuša razložiti vzroke za klimatske spremembe, ki jih povzroča naša civilizacija zadnjih 200 let (1.800 do 2.000). O tej teoriji bi želeli razpravljati in oceniti njeno izvedljivost. Filozofijo o tem so napisali že pred mnogimi stoletji, ko je nastala zgodba o Davidu in Goliatu. Toda na osnovi naših standardov mi ljudje ne opazimo svojih majhnih možnosti (kot David) in vplivov in ne vemo, kaj pravzaprav smo, kaj je naš naravni sistem, s katerimi sistemi medsebojno delujemo in s katerimi smo soodvisni, in kam spadamo. Kar razumemo, je kako s pomočjo dosežkov naše civilizacije ustvarjati denar in kako za to izkoriščati naravna bogastva, vse do zlorabe, ker premalo upoštevamo takoimenovane stranske učinke. Kaj povzročajo naši posegi in kakšni bodo rezultati, ki niso povsem neposredna zadovoljitev naših trenutnih potreb, večine ljudi ne zanima. Kar se tiče naše civilizacije na Zemlji, se moramo zavedati kapacitete biosfere, ki naj bi zadoščala za vsa živa bitja, ne da bi bilo človeštvo prizadeto. Smisel ohranjanja življenja/človeštva ni le v tekmovanju za ozko in kratkoročno opredeljene koristi, temveč večinoma v sodelovanju. Adam Smith, na katerega se sklicujejo zagovorniki tekmovanja namesto sodelovanja, ni zapisal tako, kot oni berejo: poudarjal je soodvisnost med specialisti in zahteval preglednost in družbeno odgovornost, ne pa ozke sebičnosti, ki vsaj na dolgi rok povzroča veliko težav med ljudmi in v odnosu ljudi do narave ter narave do ljudi. Dokler bomo živeli na dosedanji način, kot noji z glavo v pesku, ne da bi prevzeli dolgoročno odgovornost za dejanja naše civilizacije in njene učinke na našo lastno

⁹ »System Thinking and Climate Change System«, Ećimović, Mulej, Mayur, 2002, je dostopna na domači strani: www.institut-climatechange.si



biosfero, toliko časa bomo povečevali probleme med našo civilizacijo in našo naravo/našo biosfero.

Ni planet Zemlja dom naše civilizacije, temveč biosfera, ki je le majhen delček planeta Zemlja. Občutljivost obeh se razlikuje.

- Kakšno je trenutno stanje naše civilizacije,
- ali vidimo našo civilizacijo zadosti holistično kot sistem in
- kakšno sodelovanje potrebujemo za trajnostno/sonaravno prihodnost naše civilizacije, so vprašanja, ki so življenjsko pomembna le za naš obstoj. Ne gre za obstoj planeta Zemlje.

Če sprejmemo teorijo o izvoru naših prednikov, se je vrsta Homo Sapiens pojavila približno pred 100.000 leti, njegove prve naselbine pred približno 12.000 leti (prve naselbine v Evraziji), velike kulture (Kitajska, Indija, Mezopotamija, Egipt, Perzija) pred 7.000-3.000 let; lahko razpravljamo o tem, od kod smo. Toda kaj smo z vidika naravoslovnih ved? Biologija biosfere in planeta Zemlje ni vključena v nobenem starem zapisu ali v filozofiji naših prednikov. Religije, stalna opora naše civilizacije, so izum naših prednikov, a nikoli niso obravnavale njenega izvora. Središče je bil vedno človek in način, kako dobiti od ljudi in narave čim več. Med seboj so se prepletale ekonomija, obstoj in ideologija. Zavojevalci, kralji, voditelji, demokrati iz preteklosti (kot so stari Grki pred približno 2.500 leti) ter sedanji verski in drugi duhovni voditelji, politiki in mnogi drugi, ki so se sami oklicali, bili izvoljeni ali nastavljeni, so bili proizvod svojega časa in so vladali, kot pač so. Plemenske zgodbe o ljudeh in njihovih voditeljih opisujejo, kaj smo, ne razpravljajo pa, kaj počnemo z našim življenjem in kakšen vpliv ima naša civilizacija na biosfero.

Če sprejmemo znanstveno stališče, da smo sestavni del biosfere planeta Zemlje – narave – in po zapletenosti vrh drevesa življenja na planetu Zemlja z naravoslovnega vidika, in sistemsko teorijo kot osnovo našega razmišljanja, lahko rečemo, da pripadamo biosferi planeta Zemlja kot njen medsebojno odvisni, delujoči in sodelujoči podsistem.

Naša civilizacija je torej eden od mnogih sistemov življenja znotraj biosfere planeta Zemlja in lahko trdimo, da smo ena od civilizacij planeta Zemlja. In katere so druge civilizacije? Na podlagi naših raziskav lahko pokažemo na mnoga živa bitja in obsežne civilizacije, ki bitje Homo Sapiens večkratno prekašajo po marsičem, med drugim po številčnosti. Med civilizacijami z največjimi populacijskimi številkami so mikroorganizmi. Znano je, da je preživetje odvisno od hrane, vode, zraka in prostora, nikoli pa ni bil upoštevan vpliv posameznih vrst na možnost pridobivanja le-teh. V naravi je znanih več vrst, ki imajo zelo kratko življenjsko dobo kot posamezni predstavniki svoje vrste, kot vrsta pa obstajajo znotraj biosfere že zelo dolgo. Klasičen primer so kulture mikrobov, parazitov, ki uničujejo svojega gostitelja in sebe, vendar ne kot vrsto, temveč le kot trenutno kulturo, ki napade gostitelja. To je življenjska zgodba ene izmed mnogih vrst in narava je prevzela skrb za preobrazbo materije znotraj kraljestva življenja. To je stalni sistem preobrazbe materije »od pepela do pepela«, ki ne obstoja zato, da bi človeku dovoljeval prevlado, temveč izvaja/simbolizira kroženje materije znotraj biologije biosfere.

Poglejmo sebe znotraj te vsebine. Prve razpršene naselbine so se pojavile tam, kjer so ljudje imeli na razpolago v izobilju hrane, vode, zraka in prostora; naselbine so cvetele. Ko so se naselbine bolj približale, so se oblikovale kulture in narodi. Dokler je bilo dovolj hrane, vode, zraka in prostora, so se razvijali; ko pa je hrane, vode, zraka in prostora začelo primanjkovati, so se pričeli vojskovati za njih, ali nazadovati. Tako je končno naša civilizacija postala – v



površno dojeti praksi – globalni gospodar planeta Zemlja. Po nekaj tisočletjih je bilo še dovolj hrane (leta 1960), vode (leta 1960) in zraka (na začetku 3. tisočletja) in nekako tudi prostora. Toda na koncu drugega tisočletja ni bilo več dovolj ne hrane, ne vode, ne zraka, le prostora je videti še dovolj, čeprav tudi tega ni več na pretek. Se približuje konec naše civilizacije?

Z vidika naravoslovnih lastnosti planeta Zemlje in ved o njih se približuje in to naglo. Vendar ima vsaka kultura v biologiji svoj čas rojstva, otroštva, odraslosti, starosti in zgodovine. Iz tega se moramo naučiti uskladiti človeštvo z naravo, katere gospodar smo le navidezno in jo moramo kot svoj nadsistem upoštevati, ne le kot svoj pripomoček.

12.Sposobnost uporabe potrebne in zadostne – primerne – celovitosti kot pomembne lastnosti in predpostavke za razumevanje sistema klimatskih/podnebnih sprememb je potrebo še doseči

Dodajmo novost in razvijmo iz nje inovacijo, t.j. po praksi njenih uporabnikov njim koristno novost: ali lahko Homo sapiens doseže stopnjo razmišljanja in razumevanja, da bi se naučil, kako izključno primerno holistično upravljati naša civilizacijska dejanja, da bi bilo za vse ljudi dovolj hrane, vode, zraka in prostora za življenje. Ta cilj bi lažje dosegli, če bi razmišljali sistemsko in to z uporabo dialektičnega sistema vseh bistvenih vidikov obnašanja, ne sistemsko v pomenu zgolj preciznega opisa s posamičnega vidika (slednje je tudi važno, a ni dovolj, kot je vsak posamičen del npr. avta važen, a sam ni dovolj).

Sistem klimatskih/podnebnih sprememb je sestavni del zemeljske biosfere in ima zapleteno nalogo, da omogoča, zagotavlja, vzdržuje in ohranja osnovne pogoje življenja: temperaturo, vodni cikel, gibanje zrak-voda oceanov in morij, zaščito in kontrolo/regulacijo življenja v biosferi.

Sistem klimatskih/podnebnih sprememb je eden od podsistemov biosfere. Vprašanje je, na katere dele sistema biosfere lahko vpliva naša civilizacija, na kar bomo poskusili odgovoriti.

Življenje biosfere ima mnogo uspešnih sistemov, ki so na različnih stopnjah. Najuspešnejši in najbolj razvit je deževni gozd. Seveda sta razvoj in gospodarjenje z življenjem odvisna od geografskih pogojev, t. j. geografske dolžine, širine in višine okolja in prostora. Poleg teh pogojev je potreben dostop do vode, ki je v mnogih primerih povezan z razvojem biološkega sistema. V mnogih primerih življenje dveh mejnih področij med dvema različnima okoljema, kot so kopno/morje, sladka voda/obala ipd., tvori zelo uspešne sisteme (mangrove, korale, obalna morja, oceanske vode in podobno). Toda večji del biosfere – oceani in morja – so manj raziskani in težje je razumeti vse podrobnosti (okrog 70% zemeljske površine predstavljajo oceani in morja in 97,3% vse vode na Zemlji je v oceanih in morjih).

Splošno znanje biologije nam nakazuje, da so najboljši sistemi na kopnem gozdovi, nato sledijo pašniki, za tem pa biotopi, ki so specializirani glede na lokalne pogoje – močvirja, grmičast svet, makija (Mediteran), gariga, hribi, subarktična, arktična in antarktična področja, reke, jezera, puščave itd. V obalnih vodah oceanov in morij se nahajajo korale, mangrove in še mnogi drugi sistemi, ki spadajo med uspešne sisteme.

Vsi naravni sistemi imajo značilne fizikalne, geografske in biološke lastnosti, ki so osnova za njihovo sestavo, medtem ko sistem klimatskih/podnebnih sprememb zagotavlja osnovne



pogoje (voda, zrak, temperatura) za njihov obstoj. Mi lahko raziskujemo preteklost in opazujemo sedanost teh sistemov, ne moremo pa videti prihodnosti evolucije zaradi mnogih vplivov, ki bi se lahko pojavili.

Če govorimo o proizvodnji hrane za našo civilizacijo, sta voda in hrana tesno povezani. Voda je osnovni predpogoj za proizvodnjo hrane. Zaradi sprememb v biosferi je naša civilizacija nadomeščala vodo, ki je bila za proizvodnjo hrane naravno dosegljiva, z vodo iz drugih virov (reke, jezera, umetne akumulacije ipd.). S tem so postala okolja za proizvodnjo hrane zelo podobna umetnim sistemom in se hitro oddaljujejo od prakse biosfere.

Zaradi povečanih potreb po hrani so ljudje vedno nova območja preurejali za proizvodnjo hrane za sebe. Umetni sistemi pridelave hrane so postali stalna dolgoročna praksa (reakcije v biosferi si jemljejo toliko časa, kot ga potrebujejo, kajti narava ima vedno dovolj časa, oziroma: narava se ne ozira na čas). Reakcija je bila vedno bolj omejena proizvodnja in naša civilizacija je bila prisiljena, da izboljšuje tehnologije za proizvodnjo hrane in zaščito (ne pozabimo razlogov in izgovorov za doseganje večjih dobičkov). Iznašli smo mnogo pesticidov in uvajali vedno nove. Enostranskost inovacij je povzročila poškodbe znotraj biosfere, ki so presegle naše razumevanje. Danes je bolje, da sintetičnih kemičnih spojin ne spuščamo v naravne sisteme, ker vsaj dolgoročno delujejo na različne dele naravnih sistemov enostransko in zato škodljivo (onesnaženje vode, dezertifikacija, izguba produktivnosti obdelovalne zemlje itd.).

Tako se zdaj srečujemo z obsežno zastrupitvijo biosfere s pesticidi, ki je posledica premajhne pozornosti na zapletenost naše (edine!) biosfere.

Zaradi vedno večjih potreb naše civilizacije (pitna voda, industrijska poraba vode itd.) in zaradi povečanih potreb kmetijstva in proizvodnje hrane postajajo naravni vodni viri nezadostni. Za reševanje tega problema so uvedli mnogo inovacij, od katerih imajo mnoge nevaren vpliv na sisteme biosfere. Naj omenimo pretirano porabo sladke vode rek in jezer, kar povzroča opustošenje podtalnih zalog vode in zaradi pomanjkljivega znanja tudi fizikalne spremembe sistemov podtalne vode.

Danes smo priča velikemu pomanjkanju virov pitne vode. Zaradi onesnaženja s sintetičnimi kemičnimi spojinami in zaradi njihove dolge razgradnje pa je vprašljiva tudi kvaliteta razpoložljivih virov. Pred kratkim je postal pomemben tudi vpliv hormonov in hormonom sličnih substanc. Danes nimamo čiste pitne vode, temveč le pitno vodo, ki je onesnažena s kemičnimi spojinami in drugimi onesnaževalci v dovoljenih mejah. Če gledamo na razpoložljive vodne vire, naša prihodnost ni obetavna.

Naselbine naše civilizacije so v bližnji preteklosti in sedanosti (zaradi prevelike koncentracije prebivalstva) onesnažile in še onesnažujejo vse vodne vire v lastnih okoljih, vključno z območji, kamor tako onesnažena voda potuje. To je posledica kombiniranega učinka onesnaževanja iz mestnega življenja (številne toksične substance – naravni in sintetični kemični proizvodi itd.), ki vse končuje v vodah izpustov iz individualnih kuhinjskih korit, stranišč in sistemov odpadnih voda in iz »naravnih« rečnih tokov. Po drugi strani kmetijstvo zastruplja zemljo in podtalnico ter posledično vodotoke, ki so povezani z zastrupljeno zemljo in podtalnico. Končno se vse skupaj konča v priobalnem morju in oceanskih vodah, ki se nahajajo v različnih stopnjah onesnaženosti ali zastrupitve.



Naša civilizacija uporablja reke kot transportne sisteme za odpadke. Da bi zaščitili človekova naselja, njegovo lastnino in civilizacijske dosežke pred poplavami, so zgradili obsežne vodne gradnje. Dejansko smo s tem naravi enostransko vsilili naše civilizacijske standarde in zožili naravne rečne tokove ter s tem porušili naravne biološke filtracijske sisteme rečnih voda. Dosegli smo hiter odtok rečnih voda, vendar samo to, kajti zaščite civilizacijskih naselij s tem nismo dosegli. Dolgoročno so poplave še vedno tu, le da so mnogo bolj uničevalne. Večina rek potrebuje ekoremediacijo svojih naravnih sposobnosti za življenje, ker jih je naša civilizacija uničila.

Drugo območje s podobno usodo zadeva estuarije in priobalne vode, ki so jih v mnogih primerih spremenili v poslovne, turistične in nastanitvene kapacitete z nikakršnimi ali zelo slabimi pogoji za življenje biosfere. Odpirajo nove možnosti onesnaževanja priobalnih voda in posledično oceanov in morij.

Danes večji del človeške populacije kot kdajkoli prej živi v priobalnem pasu in je stalen vir onesnaževanja priobalnih voda. Kmalu bomo lahko brali o rezultatih stalnega človeškega uničevanja morskih in oceanskih voda.

Na osnovi podatkov, ki smo jih strnili tukaj, lahko zaključimo, da bi mnogo posameznikov in organizacij moralo začeti razmišljati holistično, uporabljati dialektični sistem vseh bistvenih vidikov v obliki multidisciplinarnega, interdisciplinarnega in supradisciplinarnega ustvarjalnega sodelovanja. Tako pretekle, kot sedanje izkušnje vplivov naše civilizacije na mnoge naravne sisteme terjajo učinkovitejšo zaščito 'naše' narave, prostora in okolja – v našo človeško korist.

Holistično razmišljanje bi moralo zajeti celotno človeško ravnanje/obnašanje, da bi naša civilizacija prevzela dolgoročno odgovornost zase in raje zaščitila naravo naše Zemlje kot doživela globalno tragedijo človeštva, kakršno povzroča s svojo sedanjo enostranskostjo.

Sistem klimatskih/podnebnih sprememb deluje ob predpogojih dinamične evolucije fizike, geografije in biologije Zemlje in njenega okolja. Človeštvo je s svojim načinom življenja v zadnjih 300 letih industrijske in postindustrijske civilizacije dokazalo svoje sposobnosti za konstruktivno in destruktivno delovanje na svoje naravno okolje. Pri tem je prestopilo mejo trajnostnega/sonaravnega življenja in dolgoročnega vpliva na biosfero planeta Zemlje. Naše ugotovitve, navedene v knjigi »Sistemsko razmišljanje in sistem klimatskih sprememb«, 2002 (v angleščini) kažejo, da so vplivi človeka na sistem biosfere planeta Zemlja individualni in organizacijski in da so tudi posledice individualne, lokalne, organizacijske, regionalne, nacionalne, internacionalne, kontinentalne, globalne in mogoče tudi univerzalne. Glavni problem je, kako bi dosegli večjo in bolj celovito odgovornost ljudi. To zahteva odločnejše politične ukrepe v to smer.

Sistem klimatskih/podnebnih spremembe, kot integralni del zemeljske biosfere, ni samo njen ustvarjalec, marveč omogoča, zagotavlja, vzdržuje in ohranja v njej pogoje za življenje. Človeštvo mora poiskati nove poti za trajnostno/sonaravno prihodnost, ki bo vsebovala nova medsebojna razmerja med našo civilizacijo in planetom Zemlja. Znanost, raziskave in razvoj, družba in vse vladajoče, ekonomske, nacionalne in mednarodne institucije morajo sprejeti širši – primerno celovit – pogled na obstoj naše biosfere in njemu ustrezno odgovoriti na nove izzive mnogo celoviteje kot doslej, vključno z mnogo več upoštevanja posrednih učinkov, saj se le-ti pogosto izkažejo na srednji ali vsaj daljši rok, če že ne takoj, za zelo nevarne in zato



osrednje posledice. Le-te je treba v največji možni meri preprečiti pravočasno, da se ne nakopičijo v skoraj nerešljivih količinah, kot grozijo zdaj.

Sedanje onesnaženje na globalni ravni (nuklearne tehnologije, CFC-ji in slične substance, pesticidi, genetske modifikacije, hormonom slične sintetične kemijske spojine, tehnološki vplivi, kot so motorji z notranjim izgorevanjem, transportna sredstva, orožje, vpliv PCB-jev na genetsko strukturo, komunikacijske in energetske žične in brezžične tehnike, itd.) odseva človeško kratkovidno razmišljanje in delovanje. Zato potrebujemo za našo trajnostno/sonaravno prihodnost dolgoročno odgovornost vsakega človeka in naše civilizacije do biosfere – okolja, v katerem živimo, dokler nam okolje to omogoča.

Pri tem moramo razlikovati vplive gospodarja naše civilizacije – profitnega motiva – od njegovega razumevanja in škodo, povzročeno zaradi pomanjkanja znanja in holizma. V mnogih primerih globalnega onesnaževanja je bil profitni motiv glavni vzrok za obsežno onesnaženje. PCB-je, CFC-je, pesticide in druge substance so proizvajali in jih še proizvajajo in uporabljajo in tržijo kot izboljšave, čeprav povzročajo škodo znotraj našega lastnega življenjskega prostora in okolja. Globalno segrevanje, tanjšanje ozonskega zaščitnega plašča so primeri pomanjkanja kakršnekoli odgovornosti naše civilizacije. Tem lahko prištejemo tudi eksplozivno reprodukcijo človeštva in onesnaževanje atmosfere. Profitni motiv tako povzroča – pogosto in v celoti gledano ogromne – stroške namesto profita, a z ozkim in kratkoročnim pogledom namesto primerno celovitega mnogi tega niti ne opazijo.

Potrebujemo raziskovanje in razumevanje, katerega namen bo dolgoročna odgovornost naše civilizacije in preprečevanje neodgovornega obnašanja sedanjih voditeljev, človeštva in izumov naše civilizacije, kot je enostranski profitni sistem, saj onemogočajo razumevanje dolgoročne odgovornosti. S tem povzročajo neodgovornost in njene hude posledice za vse nas.

Trenutno stanje biosfere, narave, prostora in okolja, kakor tudi znanstvene raziskave ter naš socialni/družbeni sistem vodijo našo civilizacijo v slepo ulico. Individualni, regionalni, nacionalni in internacionalni interesi zaradi družbenih, finančnih, političnih in birokratskih pritiskov, filozofije vojne kot enostranskega in zato navideznega razreševanja problemov, pomanjkanja tolerance med ljudmi ipd. ne dopuščajo novega primerno celovitega pristopa k vprašanju preživetja. Zato je preživetje sedanje civilizacije človeštva zelo vprašljivo.

Mi, prebivalci Zemlje, moramo doumeti potrebo po primerni celovitosti, kar bi podprlo ustanovitev svetovne ustave, svetovnega parlamenta in svetovne vlade. Če bi delovali ti organi pošteno, torej s primerno celovitostjo in družbeno odgovornostjo, ne pa kot lutke enostranskega kapitala, bi človeštvo, vključno s tem kapitalom, imelo možnosti za preživetje z možnostjo uskladiti socialna vprašanja in potrebe celotnega človeštva z naravnimi možnostmi, možnostmi prostora in okolja planeta Zemlja. Po znanih podatkih sedaj živi 85% človeštva z manj kot šest US dolarji na dan, ena milijarda ljudi celo z manj kot enim dolarjem na dan, stroški za zdravljenje ljudi in obnovo njihovih naravnih pogojev za obstoj, stroški za bolj ali manj nepotrebno prevažanje ogromnih količin dobrin na tisoče kilometrov daleč v imenu korajda nesmiselne pravice do neomejene izbire namesto domače hrane itd. pa stalno naraščajo.

Sedanje navade na Zemlji, kot so:

- uničevanje skoraj vseh voda s sintetičnimi kemikalijami,



- onesnaženje zraka s kopnim, pomorskim in zračnim prometom,
- uničenje zaradi vojn,
- uničevanje ozonskega zaščitnega plašča,
- uničevanje plodnosti zemlje zaradi prakse v kmetijstvu, vključno s pojavom novih puščav in uničevanjem deževnega gozda,
- globalno segrevanje in seveda
- eksplozivna reprodukcija človeštva,

se ne morejo reševati z upoštevanjem takojmenovanih nacionalnih in drugih ozkih interesov. Morali bi biti glavna odgovornost svetovne vlade.

Sistem klimatskih/podnebnih sprememb, ki omogoča, zagotavlja, vzdržuje in ohranja pogoje za življenje znotraj biosfere, potrebuje poseben, primerno celovit, in zato interdisciplinaren znanstveni pristop in akcijo svetovnega obsega. Zaščita narave, prostora in okolja, ki naj bi skrbela za biosfero, ravno tako zahteva posebne znanstvene raziskave in akcijo celotnega človeštva. Oboje predstavlja globalne sisteme, ki reagirajo na enostranske dejavnosti človeštva z globalnim razpadom in zato zahtevajo ukrepanje celotnega človeštva, a primerno celovito.

Zaradi preobremenjenosti znanstvenikov z vojaškimi temami in zaradi zahtev politike in birokracije žal obstoječe kapacitete znanstvenega in raziskovalnega, pa tudi razvojnega dela ne zadoščajo za potrebne inovacije dane prakse. Potreben je nov pristop za preusmeritev znanstvenega dela v pridobitev potrebnega znanja in vrednot za ohranitev narave in okolja, vključno s sistemom klimatskih ali podnebnih sprememb. Sicer ljudje ne bomo preživeli, vsaj ne v obliki današnje civilizacije.

13. Potrebna in zadostna – primerna – celovitost kot možnost izhoda iz današnje slepe ulice

Znanstveno delo je osnova za pridobitev potrebnega znanja. Zahteva posebno koordinacijo na svetovni ravni, da bi doseglo primerno celovitost, in bi moralo biti sestavni del svetovnega upravljanja. Potrebujemo neodvisne znanstvenike, ki bodo delali zaradi svojih sposobnosti in ne zaradi potrebe po dnevni/mesečni/letni plači, ki jo jim zagotavlja birokracija (tkim. 'demokratični' socialni finančni sistem) ali profitno usmerjena ekonomija. Današnji denarni sistem je postal sam svoj gospodar, pošast, ki vlada celotni civilizaciji. Lepo bi bilo, če bi ga lahko spravili nazaj v okvire, kamor spada, t.j. med služabnike človeštva. Sedaj profit ubija profit, ker povzroča odločilne stranske učinke, vključno s stroški človeštva, ki so vključeni v davke, ali pa se kopičijo nepokriti, tako da segajo v tisoče milijard dolarjev ali evrov. Kolateralne izgube so ogromne škode na sistemih narave in posledično tudi za našo civilizacijo.

Da bi lahko razumeli potrebo po svetovnem in to primerno celovitem odločanju in drugih vsebinah obnašanja, torej po svetovnem parlamentu, bi morali ljudje razumeti sisteme, v okviru katerih živimo in ki jih sami kreiramo. To je pomembno zaradi tega, ker bo katerikoli sistem v naravi ostal tak, kot je, dokler vsi sistemi in razmerja znotraj njih delujejo usklajeno. Skupaj tvorijo sistem, ki poskuša biti prijazen za življenje. Če se katerikoli večji ali manjši del sistema premakne ali spremeni, se bo začel gibati oziroma spreminjati celoten sistem. Nemogoče je napovedati, v katero smer se bo sistem gibal oziroma spreminjal. To se dogaja s sistemom klimatskih/podnebnih sprememb danes.



Končno lahko sistem klimatskih/podnebnih sprememb tako spremeni življenske pogoje znotraj biosfere in geografijo Zemlje, da bo konec naše civilizacije. Zato

14. Priporočamo

En planet, ena vlada je naše prvo priporočilo. Seveda je prva ustava federacije planeta Zemlje, ki ji po ratifikaciji sledita svetovni parlament in vlada. Osrednja značilnost te ustave je primerna celovitost ravnanja človeštva z lastnim dolgoročnim obstojem.

Drugič: priporočamo nov – celovitejši – pristop k socialnemu redu, ki bo odseval dosedanje izkušnje in vzpostavitev novih – celovitejših – medsebojnih odnosov med ljudmi na planetu Zemlja. Cilj je preprečiti eksplozijo človekove reprodukcije, povečati etičnost in toleranco med ljudmi na Zemlji, okrepiti (globalno holistične) zakone in red in s pametnim upravljanjem zagotoviti prihodnjim generacijam življenje na Zemlji.

Tretjič: priporočamo preusmeritev znanstveno-raziskovalnega dela od raziskav v vojne namene in preozko marketinško usmerjenih raziskav za razvoj sintetičnih kemičnih proizvodov ipd. v raziskave življenjskih globalnih sistemov narave, prostora, okolja in vesolja, kot esencialnih elementov znanja, ki je potrebno za preživetje.

Osnovni viri (nadaljnji viri v njih):

Ećimović, T., Mulej, M., Mayur, R., "System Thinking and Climate Change System", 2002

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THE CLIMATE CHANGE SYSTEM - INTRODUCTION

1. Executive Foreword by: H. E., Baron, Col. Chev., Acad., Prof. Dr. Roger Haw Boon Hong

I feel happy and honoured to have the opportunity to write this executive foreword, requested by the authors, for the book: *The Climate Change System - Introduction*. This is the shortest possible introduction to such a large system. I think the Climate Change System is very important for the Homo-sapiens civilization, and for all humans on the Planet Earth. The climate change system issue is just like the words of Shakespeare "To be or not to be".

ANSTED University supports the contemporary research of the environmental sciences and the climate change system issues, for many years. The book by T. Ećimović, M. Mulej, and R. Mayur, 2002, »System Thinking and Climate Change System (Against a big »tragedy of commons« of all of us)« gave a basis for the Nobel Prize Nomination in 2003. It was a peak of contemporary research on the climate change issues at that time, and till now it has provided a major understanding of the present situation in the Biosphere of the Planet Earth.

System theory, thinking, analysis and synthesis as a researcher's tools have not been in common use as scientific techniques for better understanding of Nature. After the introduction of the book by T. Ećimović, 2006, »The Information Theory of Nature, and« (the Nobel Prize nomination for physics 2007), ANSTED University published T. Ećimović and coauthors' book »The Sustainable (Development) Future of Mankind« in 2007, and then the book by S. Božičnik, T. Ećimović and M. Mulej and their coauthors from four continents »Sustainable Future, Requisite Holism, and Social Responsibility (Against the current abuse of free market society)« in 2008. It became obvious that the climate change system needed to be introduced to the global society of our present global human community. The book »The Climate Change System - Introduction«, 2008, by T. Ećimović and M. Mulej, is the first presentation of the climate change issues in English and Slovene language. We hope to provide its translations in other languages: Canadian English and French, Chinese, Italian, German, Greek, Korean, Russian etc., as our contribution for promoting understanding of the climate change system issue worldwide.

It is most important to disseminate the knowledge for people to understand the climate change system issues to prevent disappointment and to encourage mitigation of the climate change system impact on the human society/community/the human eco-sphere and the biosphere of the Planet Earth as our only home in the Universe. The complementary book »Our Common Enemy (The Climate Change System Threat)« by T. Ećimović et al, 2006, describes the possible path for survival of our civilization to a sustainable future. It has been followed, and innovated by publishing two books with discussions on the sustainable future of mankind, mentioned above, as a basis and background the book in front of you.

Please accept my recommendation for perusal of this new ANSTED University contribution towards a sustainable future of mankind.

Roger Haw Boon Hong
Professor of Corporate Social Responsibility
Founding member of the ANSTED University
Founder cum Chairman of Ansted Social Responsibility International Award (ASRIA)



2. Executive summary by authors

The term system has many contents. Here it will mean to us neither the mental picture about the event or process dealt with nor a usual method of work nor a socio-economic or other order nor a network/complex of plants or stones or humans fitting together somehow. The term system will here rather mean to us a feature/event/process that is so complex in its components, relations and influences between them and their consequences that it is difficult to comprehend and even more difficult to control. This is why we call the climate change a system. Understanding and/or controlling it per parts is not very helpful, because as a whole a system has attributes that differ essentially from attributes of each one of its parts alone. Clear cases: the edible salt is a synergy/system of two poisons; water is a synergy/system of two gases; an organization is a synergy/system of many – different from each other, unavoidably, and hence complementary – professionals; a house is a synergy/system of bricks/concrete/wood, doors, windows, electric, water and other instalations etc. Synergies emerging from their attributes provide to the new whole/system new attributes. Therefore, the truth will be easier to discover, and difficulties and development easier to control, if the feature/event/process is considered as holistically as possible rather than per single parts. This is called systemic or systems thinking. A total holism of human behavior, i.e. monitoring, perception, thinking, emotional and spiritual life, decision making and action, and a total wholeness of insights and outcomes, is usually impossible to attain, but a single specialization – a single viewpoint of profession – limits humans to fictitious holism providing for fictitious wholeness. This fact makes us apply the Mulej/Kajzer (1998) law of requisite holism as the suitable one. In the case of the climate change system this would mean the understanding that synergies of insights from physics, chemistry, biology, history, technology, economy and several more disciplines and practices are needed. One would chose and collect professions and viewpoints that one would consider essential and interdependent for mutual completing up by differences. Following the ancient Greek philosophy one would link them on the basis of their interdependence or – in the Greek wording – dialectics. A dialectical system would show up (Mulej, 1974, see Mulej 2008). In this case a system is not meant to be a complex feature, but a mental picture about it, which we introduce in order to attain the requisite holism of human behavior and requisite wholeness of its outcomes.

A systemic approach to the climate change must consider the age of Globalization, the present status of our civilization, unnatural life of humans in poly/mega and similar urban centres, management of technologies without sustainability, lack of individual and corporate social responsibility¹⁰, uncontrollable human-population explosion, short- and often medium- and even long-term ('side'-)effects of the: synthetic chemicals; modern technologies, weapons, combustion engines, transport system, nuclear technologies, industrial and agricultural production, national and international political distribution of power and administration, and their influences on the scientific global, national and local communities; they are causing a

¹⁰ Social responsibility is an attribute of humans and their organizations. It prevents or diminishes, at least, the danger of humans' abuse of their influence leading to damage experienced by their coworkers, other business or personal partners, broader society or nature on which the human existence or quality of life, at least, depend. This is a short summary of definitions in international official documents. Other references see in social responsibility an upgrading of the innovation effort/support called improvement or total quality management or business excellence. Further references see it closely linked with systemic behavior; yet further ones link it with efforts aimed at peace in the world (Hrast et al., ed., 2006, 2007, 2008, etc.). The current dangerous state of climate change system results to an essential extent from a lack of responsible behavior of humans over centuries of industrialization and all times until today.



gap between needs and results of the cohabitation of Homo-sapiens-civilization with the nature on the Planet Earth. This gap threatens this civilization to disappear.

This gap surfaces as the climate change system and global human community impacts: strong winds, large droughts and floods, tsunamis, earthquakes, large air pollutions by industrial, city life's and transport system's emissions, changes in local climatic patterns, global warming, depletion of the ozone layer, pollution of all three basic parts of the biosphere: soil, seas/oceans and air. They are due to huge misunderstanding of the climate change system by the population in local communities around the Globe. Simple language for simple people and understandable explanations are needed for sustainable future of mankind or harmony of human civilization with the nature on the Planet Earth.

It is as it is; we are, at least, trying to present the contemporary scientific approach to the present most important issue of humankind. Whether we shall understand the climate change system or not has a crucial importance for the local community life, and gives questionable chances to the long-term of survival of humankind – it requires sustainable future. Sustainability of local communities leads to the sustainable future of global human civilization¹¹.

3. The Climate Change System - Introduction

Worldwide researchers and scientists in complex problem solving, case study research, education, and many other activities of Homo sapiens as individuals and society today must take into account the climate change system affairs, which have a critical role for changes within the biosphere, and include most risky issues at the beginning of the XXI centuries.

The Climate Change System provides, makes, holds and guards living conditions within the biosphere of the Earth; it has a more important role as humans were thinking in the past. To these conditions all living creatures must adjust to survive. A number of the extinctions of species, smaller and larger alike have resulted from changed environmental qualities, caused by changes in the climate change system.

Systemic behavior enables us, better than single specialists alone, to see that the Earth's biosphere is made as a synergy resulting from *interdependences, interactions and co-operation* of matter, energy, and information within the time frame, and has three bases – Water, Land and Air environments. To be ready for changes, and mitigations due to the climate change system impacts, all of us single representatives of human race must learn more about the basics of the biosphere.

Assessment of risk of the (side-effects of) research has not been well developed during the industrial revolution and recent times; issues like: intensive agriculture; synthetic chemical production; money democracies; (poor) corporate social responsibility, nuclear technologies, combustion engines, have put substances into the Nature environments - sea ocean waters, lands and air – harming them for an irresponsibly long time. Today there is no question, whether or not, but when and how harmful, the impact of the Earth biosphere will be for the living creatures. Scientist and other people/s must understand the interdependences, interactions and co-operation

¹¹ For details see our publications: »Our Common Enemy (The Climate Change System Threat)« by Ecimovic at al, 2006, and recent books: »The Sustainable (Development) Future of Mankind« by Ecimovic at al, 2007, and »Sustainable Future, Requisite Holism, and Social Responsibility« by Božičnik, Ećimović and Mulej, 2008; all are displayed at: www.institut-climatechange.si



within the environment, and of all matter, energy, and information, to work for sustainable future of our civilization. They should use systems thinking by the Dialectical Systems Theory (Mulej, 1974, see Mulej et al, 2008) to do this job requisitely holistically and therefore successfully.

For millennia, but especially over the centuries of industrialization and even more so recently, individuals/society have practiced the use of nature, environment and biosphere as commodities free of charge. But, today this is more complex: the nature quality is worse due to the impact of the climate change system and human global population. Major impacts of the climate change system on society, such as sudden floods, strong winds, earthquakes, tsunamis and changes within the local environment, may produce bad results. Our recommendation is to:

- Apply systems thinking, e.g. the Dialectical Systems Theory linking human work and its creativity with holism of behavior, especially thinking, decision making, action, and with innovation;
- Clarify humans' relationship with their Nature, which will create better relationship of Nature to humankind.

We think it is advisable to learn to know limits and possibilities of the impact on and by the climate change system, to make clear vision of changes, which may affect human society, biosphere and the Earth. We will now briefly present some basic features of the climate change system in order to support the two suggestions.

The water/land/air systems or biosphere make the bases of life on the planet Earth. Not many researchers and public at large are familiar with interdependences, interactions and co-operation needed for survival of living creatures. The latest research on system thinking and the climate change system has important impact on knowledge of the nature for humans to better understand their environmental impacts.

From the Nature's viewpoint the climate change system alias the climate, the climate change – is a system as a complex entity of conditions within the living space of the biosphere. Actually the living space is the biosphere itself, which is a tiny part of the Earth Planetary System. Watching the climate, and taking it into consideration when humans have been making their decisions – these have been two very separated issues, especially in the recent centuries in which the industrial life has been taking the lead and has caused a narrow professional specialization to reign and prevail. One-sided insights were misleading and still are so due to oversight of synergies.

There are two main sources of the climate change: the natural ones and the ones caused by humans. We humans should understand both of them in order to accept the natural ones and to possibly prevent their tough impact on our-selves, such as floods, droughts, air and water pollution etc. But we should better understand and cope with our own tough impacts and prevent them, too.

The natural systems (as complex entities rather than mental pictures of them) could be formally set according to their size as follows:

- MACRO / MEGA / SUPERIOR / SENIOR / VERY BIG etc., systems such as the Universe, the biggest system known to humans, the Milky Way, the Solar System, the Planet Earth System etc., and



- MICRO / INFERIOR / JUNIOR / SUB etc. systems that are smaller and are either natural such as Homo sapiens / plant / animal / living creature/s, and or artificial / human-made systems such as a township / car / aircraft / rocket / satellite, etc.

Of course, the above artificial and natural systems cause a need for differentiation of sciences to natural, technical, and social sciences, of which none includes all human activities as an integral part of the nature. We think there are no artificial and natural systems, but all of them are natural as long as they are results of living creatures' activity. Let us use the terms artificial and natural systems for the time-being.

The system theory, system thinking, analysis, and synthesis are the best assistants available today for humans to understand complex problems, which both the macro and micro systems are. There is no simple system, and there is no system of which we may say that humans know everything about it. This could be stated more rightfully when one uses system thinking, which could make the difference between the scientific thinking of today and of tomorrow.

The challenges to us humans of today are much more complex than ever before, because we have reached a sort of a critical peak of our ability to understand the present time. The proof for this is our relationship with nature, space and environment, which is going to become unfriendly to humans, rather than a good friend, as it was and should be. Our civilization's anthropocentric philosophy, its present social order, its religious approaches/governances, profit-based democracies, local, national, international and United Nations' bureaucracies, totalitarian rulers, lack of tolerance between different people/s on the Earth, policies of divide and rule, bread and games (from antique times until today), ruling by information monopoly – are organizational techniques, which need innovation-of-habits/restructuring/transition/new approach for a better, or even any, tomorrow. Whether our civilization will have a better tomorrow or not is a question, which we better answer before its breakdown will happen. We think optimistically, that tomorrow will enable our civilization to understand nature, space and environment/climate change system, cosmos, and other systems. As a result this will open large doors to sustainable future for all of humans and other living creatures on the planet Earth.

The current understanding of the climate change system is limited by anthropocentric and other views; this is less so, when using systems theory, system thinking, analysis and synthesis. They could help us better understand the interdependences, interactions, and co-operation on mono, trans, multi, inter, and supra-disciplinary issues, all of them as an integral part of the inferior and superior systems, within the system of the planet Earth, and further on the Solar System, the Milky Way, and the Universe.

The Nature does not repeat itself, but it always goes in only one direction - multidimensional dynamic evolvement ahead. Its direction is not known.

We humans, with all our beliefs, religions, natural, social and technical achievements, technologies, techniques, governances, local communities, families and relationships, sooner or later think we are Gods, which have to rule the nature, space and environment of the biosphere. When it comes to the point of joint action, "mutual interest" and survival of our civilization, many excuses are handy such as national interest, national security, national citizens' wellbeing, etc. But all of them are empty phrases defending/protecting individual/collective rulers, and national elites. We believe into the role of leadership (as a cooperative management and governance), but we believe also into the moderate life style, which allows for long life, tolerance, peace, and stability, because Nature requires it.



The current understanding of the climate change system is limited by anthropocentric views. It may be explained with rule of international/national bureaucracies, who have sufficient monetary resources to pay scientists to speak and write as they wish. Redirection of scientific research, applied research, and theoretical work is hardly possible, as long as one-sided businesspersons, (their) politicians and bureaucracies are handling resources: they learned how to rule, but not how to make a holistic rather than narrow-minded progress in sciences and technologies of the planet Earth systems.

How can one explain the tremendous, but biased, development of armaments, chemical synthetic products, 800 million and more combustion engine motor vehicles, and many more combustion engines, used in aircrafts, ships, boats and agricultural machines, marketing and profit-making oriented products, transport system, promotion of “globalization” as a tool for making money, while scientists are not paid to do their basic research work, and must neglect the research needed for understanding issues of the biosphere system, which is threatening our civilization with reactions of the climate change system and the whole Biosphere to human actions?

The pending big “tragedy of the commons” of all of us
is overseen, that’s how. It results from human lack of holism behavior.

The climate change system is a macro system of the nature made of interdependences, interactions, co-operations of superior/inferior natural systems. The climate change system is responding not only to our civilization’s activities, but also to rules/practices – interdependences, interactions and co-operations – of other systems in nature. If we do not understand the climate change system, it is so due to the improperly directed research. This has nothing to do with the common humans, but with the one-sidedness of the present social order, profit-based democracies, especially in nations of the G 7 countries leading our civilization, and international as well as national bureaucracies. They lack the requisite holism and make room for one-sidedness of human actions.

Let’s us take the case of CFCs, the ozone depleting synthetic chemical products, which were produced because of the market-oriented research and production aimed at profit rather than human benefit, and caused the climate system to react with its change, which may respond with a total destruction of our civilization: **we humans must learn** how to manage ourselves. It is true that humans did not know of the side-effects of CFC’s, but now we do: there is no reason to continue with the previous practice of using materials about which we do not know how they interact in medium and long term. They include the genetically modified organisms' techniques, war technologies, uncontrolled development and use of new synthetic chemical products, and combustion engines; these are currently the most dangerous activities of our civilization, not to mention information techniques and energy transmissions influencing magnetic fields and basics of the Earth equilibrium. And last, but not least, let us mention nuclear technologies, which would better have remained behind locked laboratory doors, instead of going into use, and resulting in millions of years of pollution.

From energy and gases to planetary explorations, that’s how the origin of the Earth from birth until present times can be summarized¹².

The climate or the climate change system has been one of the biosphere systems, which is responsible for the maintenance of living conditions. As a natural system it is inferior to the

¹² From view point of our civilization (Ecimovic 2002).



Biosphere, the planet Earth, the Sun and the Solar System, the Milky Way System, and the Universe. Later on we shall look into separate systems. The climate change system has many inferior systems like: atmosphere, water - seas/oceans, terrestrial, and other areas related to biosphere, and all the mentioned systems have inferior systems, which all together make a whole biosphere system. All mentioned should be understood as dynamic, interdependent, interacting, co-operating, i.e. dialectical systems, which always evolve. The moving direction is **only dynamic multidimensional evolvement ahead**. To an uninterested walking person the nature may look like chaos, but as the late Prof. Dr. Helmut Metzner wrote in "Chaos to Bios", the nature may look like chaos to us humans, but also our achievements may look to nature like chaos, and not like order, as we believe. It is a requisitely holistic knowledge and ethics, which has to decide on right or wrong.

The climate change system is a very complex system, which is interrelated with a number of superior and inferior systems, and the main purpose of the climate change system is to maintain the energy equilibrium, mean temperature, moisture/water circle system, composition of troposphere, atmosphere and ocean's currents. Many more subsystems exist.

Definitely the climate change system cannot be explained/understood/researched with the knowledge of one or two of the presently known scientific disciplines, but the scientific research approach should be requisitely holistic, supra, inter, multidisciplinary, and done by a team of scientists working for a common goal on a supra/trans/interdisciplinary basis. It is obvious that scientists need techniques of the system theory, system thinking, analysis and synthesis, complex problem solving, and case research/studies to work successfully on the explorations of the nature.

Supradisciplinarity in terms of our research, from the natural sciences point of view, is a precondition for the individual to be able to understand the complex problems of the complex systems. The supradisciplinary work/research is above the classical scientific discipline's, at least from the viewpoint of understanding the needs of research/work/action aimed at system functioning in regular conditions and otherwise, interrelated with the system itself, and its inferior and superior systems.

The main purpose of the climate change system is the maintenance of the living conditions within the biosphere, and is calling for explanation of life. From our research in natural sciences and other findings we think that the life could be explained by the hypothesis in the following equation:

$$\text{Energy (E) x Matter (M) x Information (I) + Time (T) = Life (L)}$$

$$E \times M \times I + T = L$$

The life should be understood here as life appearance on the planet Earth, which has a unique composition/place/physics/geography/biology and is permanently evolving its own nature, space, and environment quality, reflecting the present status of the system and its superior and inferior systems' qualities. An integral part of the evolvement in the biosphere is information, which is interdependent, interacting and co-operating with energy and matter in defining the essence of a specific living creature and feature¹³. Basic information connected with life itself is in their gene structures, which are composed by four amino acids in different combinations to systems, specific of every species for which it has been simultaneously (by evolution) composed. The first

¹³ Please see »The Information Theory of Nature, and« Ećimović, 2006 (www.institut-climatechange.si)



life information has evolved simultaneously by evolvement of the first life structure, and the later evolvments have been a reflection of the evolution. All this is evolving within environment, and by interdependences, interaction and co-operation of all matter, energy, particles, rays, powers, forces and yet unknown contents of the Nature.

The living conditions are not a set, but rather a system/entity of the biosphere's environment qualities, and are preconditions for life to appear and to be. The theory of evolution, the Gaia theory, the system theory, the known past and present, and status of the biosphere are proving the above hypothesis to be correct.

The origin of the climate system and the climate change system are dynamics of the planet Earth – its appearance and existence, as a part of the Solar System's appearance and existence, and as a result of the Universe's dynamics.

The climate change system rules over the life status on the planet Earth, not by command, but by interrelations, interdependences, interactions, co-operation, impacts and consequences of the system dynamics. Here we may comment on the role of humankind/present civilization in the climate change system, which may be described as triggering the system dynamics by our activities. One of triggering effects was when humans discovered and introduced CFC's and other synthetic chemical substances, which under certain circumstances move in higher layers of atmosphere, and distort by action of chlorine ion the ozone – trivalent oxygen molecules – into oxygen. Destruction of ozone as the protecting layer was result of humankind introduction of commercially important synthetic chemical products based on CFC's.

4. Brief history of the Planet Earth as one of Subsystems of the Universe

The planet Earth appeared around 4.5 billion years ago (4.500.000.000). At that time the planet was something like a ball of energy and gases with temperature around 7.000 degrees Celsius. Within millions of years the planet was cooling down, and the firm matter was formed within two hundred million years. The oldest rocks on the Earth have been dated at 4.3 billions years ago (4.300.000.000).

The planet Earth is an inferior system to the Solar System, the Milky Way, and the Universe.

The Universe is the macro, largest, most complex of all the systems humankind may research and explore, and it consists of all matter, information, light and other forms of radiation, energy, particles, rays, powers, forces and yet unknown contents. It consists of everything that exists anywhere in space and time (conditionally time included). The universe includes the Earth, everything on the Earth and within it, and everything in the Solar System. Our Solar System contains nine major planets (one planet missing) and along with the tenth and eleventh as newcomers to the family, and thousands of comets and minor planets called asteroids. It also contains the Sun, the star around which the planets revolve.

If we estimate the total existing information in the Universe as 100 units as of now, our civilization's knowledge may be between one and two units. We have to explore and research much more as we have until now. Of course, we should not forget the system dynamics and evolvments, which both reach beyond our present knowledge of the Universe. Understanding the holistic nature of the Universe, we have to understand that the Universe's dynamics take countless forms, transitions, expansions, big and small bangs, appearances and disappearances, multidimensional levels, large and small dimensions, and all countless features/evolvments.



Second to the Universe is the Milky Way galactic System, which is a limited part of the Universe within which we humans exist. It is our first exploration target and a system about which we have to learn as much as possible. The Milky Way consist of about 100.000 billion and more stars as systems of what ever form, and a countless number of planets, micro planets or asteroids, and all other forms of energy, light, matter, particles, rays, powers, forces and yet unknown contents of any kind.

The composition of the Earth, as a planet inside our Solar System, is “unique” because of the information, matter and energy at its birth. All forms existing at the moment of appearance are included within our Earth System, and so are many more other forms of the Universe such as light, particles, rays and matter that over the time from the appearance until now have collided with the Earth. Major influences on the Earth dynamics come from the permanent energy flux from the Sun, and from collisions with asteroids, which arrive from the outer space. It is important to have this knowledge, which may help us in researching and exploring the climate change system, because the first outside effect on the climate change system is coming from the outer space as asteroids and other dangerous collisions, which have been changing and may change the equilibrium of Earth Planetary System as well as the climate change system.

From the past we may learn about a number of occasions on which the Earth climate change system has been reacting with dramatic changes of the living conditions. They were recorded as Glacial or Ice periods¹⁴, which resulted from cooling of mean land and ocean temperatures. Of course, we should not forget that land mass and salt water mass react to the change of mean temperature according to their different abilities. Land mass reacts faster, than the salt water mass. Consequently, the life on the terrestrial part of the Earth (totaling app. 30 % of Earth surface) has been affected more than the marine life, during ice periods.

5. Interdependences, Interactions and Co-operations of the Life, Climate Change System, and Biosphere

Interdependences, interactions and co-operations of the life, climate change system, and biosphere are dynamic factors for the evolution of the life forms, and the resulting environmental conditions. The primordial Earth, some 4.5 billions years ago, was lifeless and unrecognizable by our civilization standards. The air was oxygen-free and many subsystems of the climate change system known today did not exist. The climate change system itself was evolving according to the components and relations of the system as it does even today.

The rise of the life on the Earth reacted to conditions of the primordial surface, and its physical and other contents. It took Earth something like 0.7 billion years to evolve the life. The first evidence of the life is dated 3.8 billions years ago. From microbial life of primordial time to final evolving of the complex biosphere around 1.2 billion years ago there was the time period within which the biosphere evolved. The first biosphere energy transition from the anaerobic to the aerobic energy production by microbial life was responsible for the change of the atmosphere from the oxygen-free to the oxygen-reach one. The oxygen-content was around 40 % and with time it has been diminishing to 21 % as it was at the end of the XIX century.

The oxygen-content in the air was the major improvement of life conditions, which made the difference from the primordial time to the time of biosphere, from 1.2 billions years ago till the

¹⁴ Please see the »Atlas« at www.institut-climatechange.si



present time. The concentration of the oxygen in the air for living creatures to breathe, should not fall below 8 % that is somehow a minimum needed for survival. At present in some heavily populated areas of big cities, the concentration of the oxygen could fall to as much as just above 10 %; we are recommending monitoring of oxygen concentration as a precondition for survival of humans in the fragile and heavy polluted environments (big cities).

Our civilization's first settlements were built some 14.000 years ago, as a result of social life evolvement of pre-antiquity humans. First settlements on European area were built on swampy areas, for security reason, and population was up to 10.000 people. It was a result of the changed conditions within the biosphere that evolved after the last ice period, which was ending some 60.000 – 16.000 years ago. Since then the climate change system conditions on the Earth were almost at the quality of the present time. Of course, changes have existed but not as extreme ones, as the ones coming up now. The difference between today and 200 years ago is due to the extreme input of our civilization's output into biosphere such as: all sort of waste, and side-effects of nuclear etc. technologies, synthetic chemicals, human population explosion and its consequences; destruction of biosphere resulted from covering the current needs of humans. In short, and we shall work out the above-mentioned later on, those are reasons/impacts, which cause the triggering effects of our civilization on the climate change system, as consequences.

The climate change system is a natural complex entity/system. It consists of several subsystems and is a subsystem, too, of systems such as the Earth, the Solar System, the Milky Way and the Universe. It is very old and has been changing all the time, offering rather stable conditions to the life forms. In the current climate change system much more extreme changes have been taking place, over the centuries of industrialization and post-industrialization than ever before since the end of last ice age. We humans are not the only cause of this dangerous processes, but though an essential one, especially if our decisions and actions are based on a lack of systemic/holistic thinking/behavior.

The climate change system as an integral part of the Earth biosphere is somehow between its inferior and superior systems; all of them together with the climate change system itself have a number of mutual interdependences, interactions, and co-operations.

As we have mentioned before, the Universe contains all matter and energy, particles, rays, information, powers, forces and yet unknown contents. The Universe may have a dramatic influence on the Earth's climate change system, in the case of catastrophic changes affecting the Solar System, and in the case of the Earth's collisions with space body/bodies influencing the Earth's existence. It happened and may/can happen again. There is e.g. the hypothesis that a collision of the Earth with a cosmic meteorite some 65 millions years ago caused Dinosaurs to get extinct.

The largest and most superior system of the Nature is the Universe. The probability of a destructive interaction of the Earth with the Universe System is very small. Because there is a countless number of star systems and other forms within the Universe, the Earth has a little chance to experience major destruction caused by the Universe System activities. The Earth system is namely just a very small part of it.

The Solar system is a very large system, from our civilization's point of view, but a very small one from the galactic point of view, and even much smaller from the Universe point of view. The Sun and its nine planets make one small sub-system of the Milky Way Galaxy.



Actually the Milky Way Galaxy has hundreds thousands of star systems, and our Solar system is just one of them.

The Sun is the central star of the Solar System, and has 99.8 percent of the Solar System mass. It is the center of its system, and source of all energy and matter within it. Of course, it is an inferior system to the Milky Way Galaxy, which is over 100.000 billion times bigger in mass as the Solar System. The Solar System revolves around the center of the Milky Way Galaxy at a speed of around 250 kilometers per second.

For our Earth planetary system the Sun is the source of everything from birth of the planet onward, and we exist because the Sun is providing us energy, warmth, light, and all other important inputs – physical and other components and interdependent, interacting and co-operating matters. Our planet system is completely dependent on the Sun. Our present time and experience is mirroring physical, geographical and biological etc. statuses at which we are at this very moment.

Of course, the influence from the Solar System is not caused only by the Sun, but also by a number of interdependent, interacting and co-operating relations with neighboring planets, planet-like bodies of different size, Moon and other forms of energy, matter, and natural powers. The planet Venus is the closest to Sun, and the outer planet is Mars. Together with Mercury they are presenting terrestrial planets of the Solar System. The other four planets Jupiter, Saturn, Uranus, and Neptune are gaseous gigantic planets on the outer part of our Solar System. The last planet is Pluto, but it is not always the last one, because of its oval-shaped orbit, which places it sometimes before Neptune, but most of time it is the most distant one from the Sun. Recently 2 new planets have been discovered in line from the Sun and after Neptune.

The Solar System is stable, and changes in its system qualities are reflecting/influencing its entire system. The most important parts of the Solar System are the energy flow from the Sun to the planets, and the quality of each planetary system. Not only each planet's composition, but also its distance from the Sun is a deciding factor for the quality of the Solar System. The life stream of light and warmth from the Sun enables life on Earth. Both the quality of the Sun System and unique Earth's composition/distance from Sun make interdependent, interacting, and co-operating parts of the life-support system on the Earth.

Understanding of many powers and forces of nature is important. They include gravitational, magnetic, energy and matter transformations, rays and particles etc., dynamics (like the top, orbital, galactic, and of the Universe), the Solar System, the Sun and planets including our planet the Earth. Synergistically, they make characteristics, interdependences, interactions and co-operations of the whole system.

The Sun has a diameter that is 109 times bigger than the one of the Earth, and 400 times larger than the one of our Moon. All nine (eleven) planets and all other formations within the Solar System are orbiting around the Sun. The Sun and all planets move like a top and all together orbit within the Milky Way Galaxy. All this movement should be more researched to allow us to understand the basic powers resulting in interdependences, interactions, and co-operation among parts of the Solar System. The Solar System as well as all other systems is



functioning according to their given systems¹⁵/entities of parameters. Our civilization has its chance to explore, research and understand the Nature and our existence.

The birth of the planet Earth could be placed around 4.5 billions years ago. At that time the Sun provided the energy and matter for shaping its subsystems, planetary systems and other bodies. The Earth appeared as a gaseous mass which, by rotation like a top and orbiting around the Sun for a few hundred millions years, commenced shaping the planet. The composition at its birth, its distance from the Sun, and its interdependences, interactions and co-operations within the Solar System have been creating the Earth for 4.5 billions years.

6. The Earth Planetary System

The Earth planetary system is very robust. At present we are having an inner core of 1.500 miles in diameter composed of iron and heavy metals, an outer core of 1.400 miles, a lower mantle of 1.400 miles, upper mantle of 400 miles and the crust of 2 – 45 miles in diameter.

On the top of the crust, there are permanent dynamic changes caused by the natural powers by which the Earth's surface has been and is shaped. The atmosphere covers, protects and completes the biosphere of the planet up to 650 miles or 1.000 kilometers, where the Exosphere is ending into the outer space. The main subsystems of the Earth are: its planetary body, its Moon, and its atmosphere. Its planetary body has 8.000 miles or 13.000 kilometers in diameter. The Earth is the fifth planet by diameter, the largest one is Jupiter with an eleven times longer diameter, and the smallest one is Pluto¹⁶ with around one fifth of the Earth's diameter.

The surface of the Earth together with its atmosphere makes its biosphere, where we live and where the life has been a part of its system for more than 3.8 billion years. At that time in history the first appearance of the microbial life could be placed.

Among the life supporting components of the Earth, oxygen is the most important element. It forms:

- Two inorganic oxides - water and carbon dioxide, which are the life-supporting molecules, and
- Atmosphere with oxygen molecules in the air we breath, and
- The ozone layer as the protection against UV rays.

After establishment of such a support within the biosphere system the appearance of life on Earth was just a matter of time.

The outer supporting part of the Earth is the flow of light and warmth from the Sun. It is enabled by the Earth's adequate distance from the Sun, actually, and supports life on Earth rather than prevents it; on the Earth's neighboring planets Venus and Mars life is prevented.

¹⁵ We say »system« rather than »set«, because in the systems theory a system consists of two sets, mathematically: the set of its elements, and the set of relations between them (and with its environment) resulting in synergetic attributes that the entire system has, but its elements alone do not. Hence, speaking of a set would mean the traditional oversight of relations and their crucial importance.

¹⁶ Data about the new 2 outer planets are not yet known to authors; one missing planet might also have a questionable content within the present status of the Solar system.



The unique composition of the planet Earth and its distance from the Sun are two major qualities that have evolved with evolvement of the Solar System, and make the basic possibility for life to appear on the Earth.

The Earth crust surface is at present made of a terrestrial part, which covers around 30 percent of the surface, and of ocean/sea waters cover taking the remaining 70 percent of the surface. The ratio between oceans and lands was changing with dynamic changes of the Earth surface evolvments. The first appearance of the water on the Earth was the deciding factor for the formation of its surface and atmosphere. After cooling down the atmosphere was thick and much lower than now. The primordial atmosphere was oxygen-free. A big change came from the appearance of the first life forms. These were the anaerobic microbial organisms living without oxygen. They were gaining the necessary hydrogen for their synthesis of different organic carbon compounds from dissolved inorganic compounds of carbon. Change of the primordial Earth from its anaerobic to its aerobic stage took hundreds of millions of years. Bacterial life significant contribution was the sink of carbon dioxide, when their dead cells settled as sediment on the oceans bottom. There they have been transformed into numerous carbon compounds that we see today as fossil fuels. It was the time of the first energy transformation; actually, anaerobic microorganisms transformed sugar molecules to gain two units of energy per molecule.

In the next generation microbes were able to split water molecules by using the light from the Sun, and used the released hydrogen to reduce the carbon dioxide molecules. By this photosynthesis a rich biomass was produced. The end product of this reaction was the molecular oxygen, but its appearance was poisonous for the existing living creatures. It changed the life critically: the new generation of microbes was able to use oxygen in its oxidation of biomass by respiration. It was the first energy transition on the Earth, because with such a transformation of the sugar molecule they gained 36 energy units or eighteen times more than the anaerobic microbes.

The carbon dioxide was a part of water due to its solubility, while oxygen that was not solvable in water, became an integral part of the atmosphere. The concentration of the oxygen in the atmosphere was increasing and changing, and settled at 21 %, with 78 % of nitrogen, and the remaining 1 % was made of carbon dioxide, methane, and some other gaseous elements. With appearance of oxygen in the atmosphere, with influence from the Sun radiation the oxygen molecule was split down to the elementary oxygen, which in the upper layers of atmosphere made the three-valence oxygen molecule ozone. With time the ozone formed an UV-impermeable screen or ozonic protection-layer against those rays from the Sun, which have been responsible for decomposition of the dioxide molecules – the UV rays. The biosphere on the Earth responded with evolution of life, its intensification and transition from water to the Earth's terrestrial parts. The bacterial life moved to the terrestrial part of the surface, forming on it crust top a carbon-rich layer, which eventually became what we today call soil. The Earth system evolved to the stage when complex life forms were able to appear. It was some 700 hundred millions years ago. Land mammals appeared some 350 millions years ago. The human predecessors are dated some 8 millions years ago, and Homo sapiens, our predecessor, some 100.000 years ago.

So here we are – we have the Universe, the Milky Way, the Solar System, the Planet Earth System, and the life on the surface of its terrestrial and aquatic part as well as within its atmosphere. With the existing input/output effects from superior systems, especially the Solar



System, with evolved parts of the Earth system, etc., the climate change system became the provider, maker, holder, and guardian of living conditions within the biosphere.

7. Requisite Holistic/Systemic Thinking/Behavior – Basic Principles Applied to the Climate Change System

System thinking, synthesis, analysis, complex problem solving, case study approach, as well as the traditional science and research and learning, are prerequisites for opening of the Nature's knowledge box. This is a crucial goal for research and success of our civilization. Preconditions for sustainable future are directly related to human ability to support supra, multi, and interdisciplinary research applied toward this purpose.

History and status of the system could be known, the near future also, in case of continuity, but predicting the future could be done only in the case of a stable status of the system. The Earth had over 10.000 years of stability, but no more now, due to destabilization of the climate change system. It has been triggered by impact of our civilization and natural responses to that effect: when the system has been destabilized, it is quite impossible to predict any relevant information on future evolvments, and it is situation with our Biosphere.

The described facts, though, do not mean that there is no impact of us humans over the climate change system. We do have an impact for sure, and its contents depend a lot on our own thinking/behavior. Our one-sidedness is quite natural and equally dangerous at the same time, potentially leading to our own extinction. We should better add something to our behavior, which is called holistic/systemic thinking/behavior. It is briefed in the Table 1 as follows:

Table 1: The Basic Seven Groups of Terms of Systems / Systemic / Holistic versus Non-systemic Thinking¹⁷

Systems / Systemic / Holistic Thinking	Unsystemic, Traditional Thinking
Interdependence/s, Relation/s, Openness, Interconnectedness	Independence, One-way-Dependence, Closeness
Complexity (plus complicatedness)	Simplicity, or Complicatedness only
Attractor/s	No influential force/s, but isolation
Emergence	No process of making new attributes
Synergy, System, Synthesis	No new attributes resulting from relations between elements
Whole, holism, big picture	Parts and partial attributes only
Networking, Interaction, Interplay	No mutual influences

The climate change system is an integral part of Planet Earth biosphere. It has no clear-cut borders with other systems in the nature, like we humans are used to think and see. The climate change system is rather a part and complex natural system that actively takes/uses/puts/gives inputs/influences/impacts, receives outputs/influences/impacts from all inferior and superior systems, and reflects the present ones – as living conditions at the very moment of observation. Observer can go back in the history of evolvments, but cannot go into the future, due to countless possibilities involved.

¹⁷ See M. Mulej's The Dialectical Systems Theory, presented also in the book System Thinking and Climate Change System displayed at www.institut-climatechange.si



The difference between the human's traditional thinking and the systemic thinking could be described as follows, when it concerns the climate change system: when observers look at our civilization's achievement from the viewpoint of building and construction heritage, it looks nice, everything is in order, the arcs are arcs, lines are in a geometric order, and the whole construction follows a certain tradition/style/architect's mind work. Of course, there is no absolute rule: e.g. the great architect from Catalonia, Gaudi, has demonstrated his innovative approach to churches and other constructions. Also our houses, exterior and interior arrangements, agricultural activities, communications, roads/railways etc., follow a certain order, which does not look like the virgin nature. To us humans from this civilization the virgin nature looks like chaos, and we are not able to see that Nature sees us as chaos too. It is also difficult to comment whether the discrepancy between nature and the human life style is now big or small, but obviously we humans have done many various interventions and innovations, which are not a natural way of acting. So, for the conventional thinking chaos of nature is chaos, and our life style is all right. On other hand the system theory/thinking may allow us humans to see the natural chaos as order and the human's order as a sort of chaos. When not only scientists, but also common people in the local communities will have this ability, we shall have much more of a natural habitat as we do now.

When we apply the above findings to the climate change system, we may understand "chaos" as interdependences, interactions, and co-operation of many different systems of nature resulting from parts of the very complex climate change system. Of course, we should not forget that this thinking is human thinking with all good and bad attributes.

The climate change system is a composition of a permanent evolution of the natural systems, which support the biosphere as the space for living creatures within nature. We have seen dependences of the climate change system on its superior systems; let us first list the influences, which may occur from them to the biosphere.

- All changes/evolvments of the Sun System have an absolute impact on the biosphere. They have a strong impact on the Earth, and most probably grave consequences, when changes at the Sun System evolve. More scientific research should be directed towards understanding of effects from the Sun on evolvments of our biosphere. As the major provider of warmth and light the Sun has a strong influence on our biosphere.
- The Moon/Earth equilibrium has also a high ranking.
- The meteorites from the Universe, the Milky Way and the Solar System as well as other forms of matter/energy/particles/rays and the forms/powers/systems not yet known to us humans have influenced and will influence our biosphere. Fortunately, their impacts are not so frequent.
- The planet Earth's attributes studied by physics/geography/biology have a very important position. Due to permanent evolvment, interdependences, interactions, and co-operation, etc., the powers of nature have created our biosphere, and keep creating it. We humans can see its past and present. We can understand dynamics of some of the mentioned systems/powers, but not of all of them. Our current knowledge is failing to use system thinking, as a possibility to better understand the system inter/dependencies and dynamics.



- The inner core of the Earth has some 1.500 miles in diameter and is moving like a top with a different speed than other parts of the planet do. Any change in the revolutions and directions of the movements could have a strong impact on the Earth system. More research is needed, to understand this subsystem, and its interdependences, interactions and co-operations with other subsystems.
- The rest of the Earth – outer core, lower mantle, upper mantle and crust totaling some 3.200 – 3.250 miles in diameter have a number of common interdependences, interactions, and co-operation which influence the biosphere. Earth's permanent changing under its surface is broken into numerous crust plates, which are in constant motion with respect to each other because of the powerful internal forces. Volcanic activities and earthquakes are products of large-scale crust plate collisions or separations. Both activities have complex impact on our biosphere, from the local direct disastrous impacts by lava, ashes and land movements, to the even tougher impacts in cases of strong eruptions and large inputs of ashes into our atmosphere. They result in impacts on the biosphere as a whole.
- The natural powers such as gravitation, magnetic force, electricity, etc., circular movements like a top and joint movement within the space of the Solar System, the Milky Way, and the Universe are extremely important and not yet fully understood by our civilization, as well as the particles movements and system abilities.
- The climate change system – the provider, maker, guardian, and holder of living conditions within our biosphere has been composed of a large number of systems, which are interdependent, interacting, and co-operating to evolve into the present condition at the place of observation, all at same time. Thinking globally, the climate change system could be observed in some of patterns or expressions or variations, which show up in different values of temperature, moisture, and currents.
- The biosphere is composed of terrestrial, aquatic and atmospheric subsystems. Their characteristics are basically the frames, within which the climate change system has its role as the provider, maker, holder and guardian of living conditions.
- Very well known geographical facts of the Earth, such as latitude, longitude, and altitude are qualities decisive for warmth and light, which are reflected in the quality of local environment. On the other hand the distribution of this quality depends on the basic characteristic of land or aquatic environment. Of course, when differences meet, at bordering environments, their quality is more complex. And it is not so simple, when taking into account complex interdependences/interaction/co-operation of all different systems together, which have something to do with the climate change system.

From the selected viewpoint, the most important inferior system of our biosphere is life on the planet Earth. As soon as the primordial Earth was ready to host life, it appeared. In ocean waters the anaerobic bacterial life was the first to influence all latter evolvments. Due to the exceptional reaches of ocean waters full of inorganic compounds the first bacterial cells had an excellent life environment. The ocean waters protected them from UV rays and the temperature of waters was suitable. The light and warmth from the Sun had a lower radiation than today. All phases of the anaerobic life lasted from its commencement on from around 3.8 billions years ago until the appearance of oxygen in the atmosphere around 2 billions years ago. The bacteria have changed the Earth's biosphere from an oxygen-free to an oxygen-rich one, from an environment unprotected against UV rays, to environment with ozone layer as



UV protection zone. Sterile terrestrial lands changed to lands rich with life. After the change from the anaerobic to the aerobic life the biosphere changed, and many complex life forms evolved. The water cycle, the oxygen cycles, the carbon dioxide cycles, the sulfur cycle, and waste of organic compounds together with life itself have been an integral part of the biosphere's environment. The basic influence transferred the fragile environments into life-friendly environments, and resulted in protection of the Earth surface against erosion and its consequences such as destruction of lands, ocean water currents, and air movements that have been established as regular or temporary. The biosphere was evolving and became the space for life and living creature. Physical, geographical, chemical, biological and systemic interdependences/interactions and co-operation enabled an environment supportive of evolution of life. Today, we may find at the same time within the Earth biosphere primordial conditions as well as any later evolutions, which followed them later on. Our present biosphere has a countless number of biological sub-systems, which are, along with their synergies, ensuring the life continuity in the present and many other possible and changed environments.

The terrestrial lands, from the frozen Arctic/Antarctic environments to the tropic conditions, are home of a large number of different living creatures systems, which all together make a comfortable living as long as they follow the system interdependence/interactions and co-operation. All ethological differences are a part of the maintenance of environmental matter exchange, in which numberless biosphere sub-systems evolved for the life to continue. The changes/evolutions are consequences of interdependences/interactions and co-operation of all systems involved. The same apply to the evolution of the aquatic and atmospheric environments. ***The biological system is a moderator of living conditions within the biosphere.***

The Sun provides energy – light and warmth. The planet Earth protection systems are ozone protection zone in the Stratosphere (15 – 24 kilometers) and the green house effect (the natural parts of which are carbon dioxide, methane and nitrogen oxide). Both protection systems are filtering/transporting radiant energy to the Earth surface and back to the outer space. In geographical terms, the Earth surface has now around 30 % of terrestrial and 70 % of water areas (oceans/seas). The energy equilibrium results from inputs and outputs of energy. Changes within inputs and outputs interfere with energy balance, and their consequences is either cooling or warming. But due to the complex system characteristics of the Earth such as: changes in the atmosphere, changes at the terrestrial part, changes at the oceans/seas waters, changes within the biology of the surface, and anthropogenic inputs, its reaction to warming or cooling follows different patterns. The air movements and oceans/seas currents have an additional influence adding to this complexity. ***The energy balance is a most important life supporting system, and the changes within it are very destructive for the biology of our biosphere.*** Changes result in extinctions of animals, plants and bacteria, and appearances of new forms of the life. Drastic changes are known as glacier or ice periods; in the past the Earth experienced a number of them.

8. The Water Circle – a Crucial Component of the Climate Change System

The water circle makes the difference between Planet Earth and the other terrestrial planets Mars, Venus, and Mercury. It is a part of the biosphere and has surfaced at the birth of the Earth. The water cycle is a sub-system of the biosphere, which provides the basis of quantity/



quality of the biosphere environment. After birth of the Earth, as soon as it had become cool enough, water appeared in liquid, ice, and gas forms; the water cycle commenced its permanent action and evolvments. As an environment it has excellent transport and interaction abilities, which probably, together with other sub-systems: cloud formation and movements, lightening and natural electricity, assisted the birth of life. Life appeared in aquatic environment, and it took almost two billions years for life to move from the aquatic environment into terrestrial lands. 97.5 % of the Earth water is there in oceans/seas, and fresh water makes 2.5 %, of which: 68.7 % is there in glaciers (which are diminishing due to the climate change system impact on the main surface temperature), 30.1 % in underground waters, 0.8 % in permafrost (also decreasing), and 0.4 % in surface and atmosphere waters. Surface and atmospheric waters are: lakes 67.4 %, top soil moisture 12.2 %, atmospheric waters 9.5 %, swamps/marsh lands 8.5 %, rivers and streams 1.6 % and biota waters in living creatures 0.8 %. Yet water is a needed quality of biosphere, as a precondition of life. Most living creatures have between 75 and 95 % and more of water content within their bodies. Water is the main transport system within cells, tissues and all the body. Water is the main environment for chemical processes in nature. Water is the main architect of nature, when carving mountains, lakes, rivers, and shaping the Earth surface.

Life and water,
Water and life,
Life,
Water.

From the book “Slovenia Yesterday, Today and Tomorrow, Water Management Challenge to Slovenians in the Third Millennium”, by Ecimovic, Jan and Vrhovsek, Ljubljana, Slovenia, 1998 (in Slovenian).

The water movements/currents of oceans and seas result from the temperature and salinity difference, winds and interdependences/interactions and co-operation of other Earth systems – gravitation, Earth movement, air movement, energy balance, Moon and Sun gravitation, etc. The present status of oceans currents has an important role within the climate change system. Changes within them may have dramatic consequences for all other parts of Biosphere. Tsunami catastrophic disaster in last days of 2004 has demonstrated the power of Nature.

Air and water are permanently interdependent, interacting and co-operating, when water changes from liquid to water vapor, which is transportable by air. When temperature changes in the processes, assisted by the air particles (physical or biological), the water vapor changes into ice and liquid form and comes down to the surface as precipitation.

Mountains are water towers of the terrestrial surface, and the forest is the primary filter of water and its transporter to the underground. Rivers take water to lower altitudes; with their biological system they are secondary filters/conditioners of water. The river waters are the main transporter of mineral components from mountains and higher altitudes to lower altitudes and finally to the seas.

When waters from higher altitudes do not find their way to lower altitudes, lakes show up, and with their biological life they form the lake waters systems. Of course, lakes can have river water input and river water output, but the lake water body is placed under the level of water outtake. Lakes are the water storages at higher altitudes.



Swamps, swamp-forests and marshland areas are the best biological filters of water, and they usually are placed at lower altitudes and as estuaries. At all locations where water (fresh or salty) and land meet, there are the biologically richest regions. The planet Earth matter exchange is possible due to water's active transporter role, and the activity of environment with biological richness, which helps our health by purifying the terrestrial surface waters.

The underground waters transport water under the Earth's surface and provide water in water springs. There are large underground waters at deeper levels of terrestrial and ocean/seas bottom levels, which are there because of the Earth crust movements. They are underground lakes of waters rich with minerals and usually sterile.

The terrestrial surface water movement results from both the altitude and gravitation: water has the golden ability to move downward (gravitation), and it has a leveled surface when staying. The terrestrial, biological and atmospheric waters are less than one percent of total waters on the Earth, but due to water circle they are an important sub-system of biosphere.

9. The Atmosphere as another Crucial Part of the Climate Change System

Between the Earth body and outer space there is a large environment of gasses, rays, particles, nature powers and forces called atmosphere reaching up to 1.000 kilometers. The first ten to fifteen kilometers are called the troposphere, the lower part of the atmosphere. It is the weather-impacting subsystem where the air movement is most frequent. It is here that clouds are formed and move; here, one can find living creatures, from birds to microbial life forms. Troposphere is followed by the stratosphere reaching 15 – 50 kilometers from the Earth's surface, including the ozone protection layer (15 – 24 kilometers). Mesosphere (50 – 85 kilometers) and Thermosphere (85 – 400 kilometers) end into exosphere, which ends into outer space at the altitude of around 1.000 kilometers. The atmosphere is a gaseous cover of the Earth surface and it is an integral part of the biosphere and of the whole Planet Earth System. It takes, transports, rebounds, transforms the cover of the Earth for the Sun's rays of light and warmth, as well as for any rays/particles/outer space bodies/nature powers meeting the Earth as a whole.

Two main gases make 99 % of the atmosphere: nitrogen 78 %, and oxygen 21 %. As everything in nature their distribution, movement, and content change within limited possibilities. The remaining one percent is made of the natural presence of carbon dioxide, methane, water vapor, nitrogen oxides, argon etc. The oxygen is present as dioxide, ozone, carbon dioxide, and water vapor. Our civilization has contributed additional contents of gases into atmosphere such as: additional carbon dioxide, additional methane, nitrous oxide, chlorofluorocarbons CFCs, hydro fluorocarbons HFCs, perfluorinated carbons PFCs as greenhouse gases. As photo-chemically important gases there are carbon monoxide, oxides of nitrogen, and non-methane volatile organic compounds NMVOCs, which indirectly contribute to the green-house effect.

The atmosphere is the largest part of biosphere. It has an important role of making life possible by oxygen concentration, which is the life-supporting gas amongst the atmosphere gases. Secondly it is the area of water vapor transport, cloud formation, and the main transporter of the water circle, important from the biology point of view.



The air movement in the multidimensional space has regular and irregular patterns, and now during the climate change system movement the extreme air movements are recorded. The wind speed of up to around 500 + kilometers per hour has been recorded in the last 20 years. For the biosphere, the air movement is of great importance as a transporter of life forms, moisture supplier, and local weather maker. On the other hand it is antagonistic to the human constructions, which are usually demolished, if they are constructed at too low standards of the wind/tornado/typhoon strength, when it occurs.

The carbon cycle was probably the most important cycle during the primordial Earth times, because it caused the crust formation and carbon layers deposition at ocean/seas bottom and on land surface. It is a direct in/output of biology, and partly of the biosphere chemistry, processes.

Carbon is a constructing element of the biosphere. A very fast (less than 1 year) exchange of carbon is typical of the plant life. It is today the second carbon exchange, which takes the first place as the very fast carbon exchange. Fast (1 – 10 years) carbon exchange comes from soil and oceans/seas surface. Slow (10 – 100 years) is exchange of carbon within the forest systems. Very slow (more than 100 years) carbon exchange is important in the biosphere as deposition of carbon by microbial life and Calcium carbonate sediments/rocks. Due to the relatively slow processes within the carbon cycle in nature, and the relatively fast input of carbon by our civilization into our biosphere, we face a situation, which the existing processes in the biosphere are not able to compensate. It is one of the reasons for the global warming.

The sulphur cycle has been a less important cycle in the nature during the time when our civilization did not exist. It has its important role within nature, but our civilization causes damages in nature by increased quantities of sulphur (acid rain) that have become fast a damaging factor. The sulphur is an essential element for the life to exist on Earth.

10. Our Civilization as a Hampering Precondition of Climate Change System

Be our civilization an inferior or a superior system of the biosphere, the planet Earth, Solar System or Universe, it is a small system, but an influential integral part of the whole. Today we are discussing our problems of nature, space and environment protection (protection against whom?), but even the great Greek philosopher Plato stated more than 2.000 years ago:

“When there still were forests growing in the mountains of Attica, the rich soil received water and stored it, so that the absorbed mass slowly became distributed from the heights, feeding fountains. But now the fatty and rich soil has been washed away and just the meager framework of the landscape is still present – comparable to the skeleton of the body attacked by illness”.

The systems have not been properly named “important and unimportant systems”; all of them are systems and interacting/interdependent and co-operating to produce the results present in the Biosphere now. But we humans did not follow the nature’s instructions that we should think of interdependences, interactions, and co-operations enough, so far. The Dialectical System Theory may offer a more promising possibility/tool than the General Systems Theory; we have discussed that in our book “System Thinking and Climate Change System”.



The climate change system as an integral part of the Earth Biosphere', has a bigger influence on our civilization as we humans of our civilization think and believe. In absolute terms the climate change system is provider, maker, holder, and guardian of the living conditions, which are making our life possible. But we humans are one-sided, although mostly trying to do our best in our modern relations to nature and each other; thus, we do not appreciate this fact, but harm the climate change system as much as we can, yet it could be even worse.

There is a theory of the anthropocentric interference with the climate change system, trying to explain reasons for the climate change caused by our civilization over the last 200 years, 1800 – 2000, and we would like to discuss it and to assess feasibility of such a theory.

The philosophy about this issue was written many centuries ago when the story of David and Goliath appeared. But by our standards we humans do not view our David-like abilities and impacts as a general practice, and we do not know what we are, what is our natural system, which systems are we interacting/interdependent/interrelating and co-operating with, and where do we belong. What too many humans do understand is how to make money out of our civilization and how to use/misuse/abuse the nature's richness for it. What are our impacts and what could be their consequences, most of us humans do not care. For our civilization to survive on the Earth, we have to recognize the biosphere's limited capacities for our, human, species to be successful rather than to harm ourselves. It is not only competition but also, and most of all, interdependences, interactions and co-operation, which enables our civilization's life. As long as we shall live on the present paradigm, which could be seen as hiding the reality and misusing/abusing the Nature, rather than take the long-term responsibilities for our civilization's impact on our own biosphere, we shall be increasing the discrepancy between our civilization and our nature/our biosphere – and diminish our benefit from it.

It is ***not the planet Earth*** that is the home of our civilization, but ***the biosphere***, which is a tiny part of the planet Earth. Vulnerability of the two are two, not even comparable, issues.

The present status of our civilization says, that humans do not see our civilization requisitely holistically – as a system, and overlook what are interdependences/interactions and co-operation needed for a sustainable future of our civilization. Though, these are the issues of “to be or not to be” and important for our civilization's well being.

If we accept that the origin of our ancestor, the Homo sapiens has been dated some 100.000 years ago and her first settlements some 14.000 years ago (the first settlements in Eurasia), and great cultures (China, India, Mesopotamia, Egypt, Persia) 7.000 – 3.000 years ago, we may discuss *from where* we are. But *what* we are, from the point of view of the natural sciences – biology of the biosphere and planet Earth, this issue is not included into any old script or our predecessors' philosophy. Religions – the permanent supporters of our civilization are our predecessors' innovations, but they have never discussed the origin of the civilization. Their focus has always been on human being and how to take from people as much as possible. Existence, economics, and ideology have always been interdependent. Warriors, kings, rulers, democrats from the past (such as the ancient Greeks some 2.500 years ago) and present, religious / spiritual leaders, politicians and many others, who have been self-appointed, elected or appointed, were products of their time and ruled as they ruled. The tribe stories – on and by people, chiefs, and spiritual leaders – describe what we are, but do not discuss what are we doing for our living, and what is our civilization's impact on the biosphere.



If we accept that we humans are an integral part of the planet Earth biosphere – nature, and the peak of the life tree on the planet Earth, from the natural sciences point of view, and take system theory as our thinking tool, we may say that we belong to the planet Earth biosphere as interdependent part/content/living creature.

Thus, our civilization is *one of the many living systems* inside the planet Earth biosphere and we may say that we are one of the planet Earth civilizations. Which are the other civilizations? From our research we may point to many living creatures and large civilization, which are out-numbering Homo sapiens by the number of their members many times. Among the largest populations are microbial species, etc. It is known that survival is based upon availability of food, water, air, and space, but what has never been considered, is the impact of the species on the food/water/air/space availability. In nature many species are known, which have a short lifetime, as individuals/individual representatives of their species, but as species they have been around for very long time. The classical case are microbial cultures – parasites, which destroy their host and themselves, but not as species, but as a present culture invading the host. This is a life story, one among many others. And the nature has taken care of matter transition within the kingdom of life. It is a permanent system of matter transition from “ashes to ashes”, not used for ruling the humans but presenting the circling of matter within the biology of the biosphere.

Let us see ourselves in this context. First scattered settlements were where the food, water, air, and space were abundant, and settlements flourished. When settlements had joined, the cultures/nations were established. And as long as the food, water, air, and space were abundant the culture was in good shape, but when food, water, air or space became restricted, the culture went down. So finally our civilization has come to ***Age of Globalization*** and became our and global ruler of the planet Earth. After a few millennia, food has still been abundant (in 1960's), and water was abundant (in 1960's), and air is abundant (at the beginning of the third millennium), and space looks like being abundant. But at the end of second millennium the food was no more abundant, the water was no more abundant, the air was no more abundant and only space still looked like abundant, which in fact is neither so any more. Is the end of our civilization approaching us?

From the natural sciences point of view: yes, it is. But, any culture in the biology of the biosphere has its time of birth, childhood, adulthood, old ages, and history, anyway.

11. Human Capacity of Requisite Holism – a Crucial Precondition of Benevolent Climate Change System Process Still to be attained

The novelty to be attained – and to be made innovation – could be the ability of the current Homo sapiens to think, understand, and learn, how to *requisitely holistically* manage our own civilization affairs, e.g. provide to all humans food, water, air, and space for living. This task can be done better, if the systems thinking is used, but rather the Dialectical Systems Theory addressing the human attribute and interdisciplinary cooperation than those systems theories that focus on precise decription of a feature from a single viewpoint.

The climate change system is an integral part of the Earth's biosphere and it has a multi-complex purpose to provide, hold, make, and guard basic conditions of the life: temperature, water cycle, air-sea-ocean movements, protection, management and regulation/control of the biology of the biosphere.



The climate change system is one of sub-systems of the biosphere. Which parts of the biosphere system could be affected by impact of our civilization is a question, which we shall try to indicate an answer to, now.

Biology of the biosphere has many successful systems, which are in different stages of life. The most successful and the best evolved is the rain forest. Of course the geography, i.e. longitude, latitude and altitude of the environment and space impact the conditions and possibilities for evolvement and management of life. Second to these conditions is availability of water, which in many cases is closely connected with evolvement of the biological system. In many cases the biology of bordering regions between two different environments land/see, fresh water/land etc., include very successful systems like mangroves, corals, coastal sea and ocean waters etc. But the bigger portion of the biosphere is made of oceans and seas (around 70 % of the earth surface are oceans/seas and 97.5 % of all water on the Earth is in the oceans and seas) and they are less researched and more difficult to know in details.

A general biological knowledge may indicate that the best biological systems on the terrestrial surface are the forests, the second are grasslands, and then come the biotopes specialized according to local conditions – swamps and marshes, bush lands, makia/gariga (Mediterranean), mountains, the Sub-artic, Artic and Antarctic regions, rivers and lakes, deserts, etc. In coastal waters of oceans and seas there are corals, mangroves, and many more as biological systems belonging to successful stories.

All natural systems are composed of physical, geographical and biological characteristics, which make a basis for their composition, while the climate change system provides, makes, holds, and guards the living conditions (water, air, temperature) to provide/guard their evolvments. We may explore the past and see the present of these systems, but we cannot see future evolvments, due to many possibilities and influences involved.

Water and food are very interdependent, when we discuss the food production of our civilization. Water is a basic precondition for food production. Due to changes in the biosphere our civilization was replacing water available for food production naturally with water from other sources – rivers, lakes, artificial accumulations, etc. Actually, by doing so, the food producing environments have become very similar to the artificial systems, and have been moving fast out of the biosphere patterns.

Due to increased demand for food, new areas have been put into exploitation, which have not been used before. The artificial food producing systems entered a long-term use (reactions in the biosphere are taking time as long as they need, since nature always has enough time, or nature does not care for time, etc). The reaction was very much limiting the production ability, and our civilization was forced to innovate technologies for food production and protection (not to forget the profit/money-gaining reasons) of the food production systems. Many pesticides were invented and then innovated. One-sidedness of the purpose of innovation has been resulting in damages within the biosphere that have gone far beyond our ability to understand them, when we commenced to use pesticides. Today the synthetic chemical compounds should better not enter the natural systems, because of their long-term damaging effect on various parts of nature systems such as water pollution, desertification and lost productivity of agricultural lands, etc.



Now we face a large intoxication of the biosphere with pesticides. It is a consequence of lack of consideration of both complexity and complicatedness of our (only!) biosphere.

Due to an exaggerated growth of the needs of our civilization (drinking water, industrial consumption of water, etc.), and demand for agriculture and food production, the water sources in the nature are becoming insufficient. Many innovations were used for solving this problem, of which many have had an impact on the biosphere systems. Let us mention here the exaggerated use of fresh river/lakes waters, resulting in the destruction of underground deposits and lakes of water, and combined with a lack of understanding the physics of the underground water deposits systems, etc.

At present we face large deficit of fresh water sources, and quality of present sources is questionable, due to pollution by synthetic chemical compounds and their long-term effect. Recently, also the influence of hormones and hormone-like substances are becoming more and more important. Today we do not have clean fresh water supply, but fresh water supply, of water quality within the limits of allowed level of intoxication by synthetic chemical compounds and other pollutants. From water supply viewpoint our future does not look nice.

Our civilization's settlements of near past and present (over-concentration of people and self-creation of the fragile environment – mega-cities etc.) has caused the pollution of all waters in such regions, including areas as far as such polluted waters travel. Actually, the pollution has been a combined effect of pollution from city life (countless toxic substances – natural and synthetic chemical products, etc.) ending in the waters from individual kitchen outflows and sinks, toilets and sewage systems, and from the “natural” rivers flows. Secondly, the usual agriculture intoxicates lands and underground waters and further waters connected with intoxicated lands and underground waters. Finally all this is ending into coastal sea and ocean waters, which are in different stages of pollution/intoxication.

Our civilization has used/uses rivers as sewerage transport system. To achieve the combined effects of the protection of human settlements, citizen's properties, and civilization's achievements against the natural river waters floods, huge hydro constructions were introduced. Actually, by our civilization's standards, we have straightened the natural river flows, and by doing this, we destroyed the natural/biological river waters “filtering” systems. We achieved a fast running of the river waters, and only this, because we did not protect civilization settlements and achievements against floods. In the long-term the floods are still there, but with a much more damaging effect. A majority of the rivers need eco-remediation of their natural abilities to host life and other qualities destroyed by our civilization.

A further topic with a comparable destiny tackles estuaries and coastal waters, which in many cases were reconstructed into businesses, settlements, and tourist resorts with poor natural biosphere characteristics. They are opening new frontiers for pollution of coastal waters and as a consequence the oceans/seas waters are getting more and more pollution by synthetic chemical compounds and other pollutants.

Today a larger share of human population of our civilization than ever lives on coastal lands. The pollution of coastal waters is taking place, and soon we shall be able to read results of our continuous action damaging the quality of sea and ocean waters. They will be unpleasant.

With our civilisation constructions and developments more and more land is changing natural characteristics. At present in Europe land use distribution is: 47 percent agriculture, 36



percent forestry and 17 percent constructions and developments or sealed¹⁸ land, lost for ever for the Nature/Biosphere.

The data briefed here make us conclude that many individuals and organizations need to learn and apply system/holistic, actually a requisitely holistic thinking/behavior. Both the past and present experiences of our civilization's impact on a large number of natural systems are calling for more effective nature, space, and environment protection from members of our civilization. In reality, we need diffusion of the requisitely holistic thinking for a broader impact towards better and more suitable behavior, in order to attain our civilization's long-term responsibility and preserve our nature of our Earth/Biosphere rather than to suffer a global tragedy of our commons.

The climate change system operates under preconditions given by the dynamic evolvement of physics, geography, and biology of the Earth and its environment. The humans, with their life practice over the last 300 years of industrial and post-industrial civilization, have been proving their ability to influence constructively and destructively their natural environment, and are going beyond the border of a sustainable life and its long-term influence on the biosphere of the planet Earth. Our findings exposed in our book "System Thinking and Climate Change System" demonstrate that the human impacts on the planet Earth's biosphere system are both individual and organizational, and their consequences are individual, local, organizational, regional, national, international, continental, global, and perhaps even universal. Therefore the selected problem is how to attain a better and more systemic long-term responsibility of humans to humans, including the one via nature. The selected viewpoint considers the potential political measures toward this responsibility. It would be proper to think that the Age of Globalization is asking for a new approach¹⁹.

The climate change system as an integral part of the Earth biosphere is not its creator, but its provider, maker, holder and guardian of the living conditions. Humans have to find a new path towards sustainability or sustainable future, which will provide for more holistic mutual relationship of this civilization and the planet Earth in the newly evolved conditions. The sustainable future of humankind could be defined by "harmony of the present civilization with the nature of the planet Earth"²⁰.

Knowledge creators and its users, sciences, basic and applied research professionals, development specialists, society, and all governing, economic, national, international institutions/subjects, etc. need to accept a broader – requisitely holistic – view at the given evolvments in our biosphere, and to respond adequately to their new challenges.

The present pollution on the global scale (synthetic chemicals, nuclear etc. technologies, CFCs and similar substances, pesticides, genetic modifications, hormones-like substances from our civilization's synthetic chemical production and medication, technologies' impact – combustion engines and others, transport equipment, armaments and other war equipments, PCBs with impact on gene structure, etc.) reflects samples of our civilization's short-term and

¹⁸ Sealing of lands is process of putting human eco-sphere in human rather than natural order, or constructing and building living environments for humans and livestock, constructing infrastructure, industry and other facilities, churches and religious centres, education and sport facilities etc.

¹⁹ New approach has been researched by Prof. Dr. Slavko Kulic, IOM, from Zagreb, Croatia, and his research has been done many years ago, but it is still waiting for its implementation.

²⁰ Taken from the book "The Sustainable (Development) Future of Mankind", Ecimovic et al., ISBN 978-961-91826-2-8, 2007, displayed at www.institut-climatechange.si



narrow-minded behavior. What we need for our sustainable future is our long-term social responsibility for our civilization's impact within the biosphere; it impacts us via nature.

Here we have to distinguish the impacts of the ruler of our civilization – money or profit motive – from the understanding of it and the actual damages done by by-products caused by the lack of knowledge and holism. In many cases of global pollution the profit motive of our civilization was the main reason for large pollution – PCBs, CFCs, pesticides, plastics, etc. – which were and are produced, promoted, and marketed as improvements, but have resulted in damages in our own living space or environment. Cases include the population's explosive reproduction, and pollution of the atmosphere.

We need research, understanding and values/culture/ethic/norms supporting the long-term responsibility of our civilization in order to stop the irresponsible behavior of the present rulers in economies and societies, the humans. Our civilization's products such as the one-sided profit system, which causes a failure of understanding of the long-term responsibility, and hence causes irresponsibility, are detrimental to our-selves, at least in a longer term.

The present status of the biosphere, nature, space and the environment, as well as the scientific and research knowledge available to humankind, but not applied on a requisitely holistic basis of behavior, and our social system, are driving our civilization in a dead alley: the short-term and narrow-minded views are favored too much. Individual, regional, national and international interests do not permit humankind to take a new – requisitely holistic – approach to survival by their social, financial, political, and bureaucratic pressures, war/redistribution rather than creation-oriented philosophy, and lack of tolerance between people.

We, the people of the Earth, have to recognize the need for action towards the establishment of an honest and requisitely holistic world constitution, world parliament, and world government as a possibility for our survival, with responsibility to co-ordinate social issues, and to harmonize the needs of the entire humankind, and the nature, space, and environment capabilities, needs, and possibilities. Age of globalization is asking for new – requisitely holistic – approaches and behavior.

Co-ordination of important issues for the Earth/Biosphere by a united single government could respond to research results by practical application of them and requisitely holistic and honest rather than one-sided and biased relationship between our civilization and the Biosphere. At list we may have proper management of important issues with more or less good possibility for success. Global democracy (but not money democracy) could be proper recommendation for entering age of globalization with a sustainable future of humankind by global governance.

The present practice on the Earth such as:

- The destruction of nearly all waters with synthetic chemicals, bio and air (rain-induced) pollution,
- The destruction of air by the land, sea, and air traffic,
- The destruction by the results of war actions,
- The destruction of the ozone layer,
- Destruction of the soil fertility by the agriculture practice, including erosion and desertification,
- Global warming and other impacts from the climate change system and of course



- The explosive reproduction of humankind, and
- Diminishing motives for hard work and creation on the part of the affluent minority of population, because affluence has always caused the cult of laziness and hence destruction.

All of these and similar attributes should be parts, which have to undergo transition, changes, researching, learning and requisitely holistic approaches for a better tomorrow of all and survival of the current civilization.

The given practice cannot be dealt with by simply taking narrow-minded and short-term oriented individual, local or national interests into account and meet them in mutual isolation. The crucial ones should be a major responsibility of the world government.

The climate change system, which provides, makes, holds, and guards the living conditions in our biosphere, needs special scientific research, and world governing action. Nature, space, and environment protection by and from members of our civilization, which should take care of the biosphere, need special scientific research and world governing action, too. Both groups of topics are two global systems reacting to the human one-sidedness by causing global entropy tendencies, which require a global level of the requisite holism in humankind's dealing with them.

The necessary scientific and applied research to cope with the above issues cannot be provided on the basis of our civilization's current scientific and research practice and capacities, due to the engagement of scientists with armaments/war and other misuse/abuse efficiency development, and the demands of bureaucracy. Therefore, a new approach is needed for a redirection of scientific work towards the needed knowledge and values capable of saving the nature, science, and the environment including the climate change system – for humankind to survive.

12. The Requisite Holism – a Way to overcome the Blind Alley of Today

Scientific work, as a basic source of knowledge, needs special co-ordination at the world-wide level and should be an integral part of the world governance, but a requisitely holistic rather than a biased one. We need independent scientists, who work because of their scientific thinking/acting and practicing ability, and not because of need for daily/monthly/annual salary given to them by bureaucracy (democratic profit-based/dependent societal system), or narrow-minded and short-term focused marketing/profit oriented economy. The money system today has become a master of its own, a monster which rules the entire civilization. It would be nice to put it back, in the frame where it belongs – the servant of humankind. Now, profit is killing profit by causing side-effects having crucial impacts, including humankind's cost covered by company taxes or piled up to be covered in near future in huge sums and tough consequences.

It is obvious that corporate social responsibility is not a part of present mankind ethics, but declarations for promotion purposes only, mostly. When and if the corporate social responsibility and the individual social responsibility of humans will be a part of each and one representative of our species, the sustainable future of mankind will have better chances to prevail.

To be able to understand the need for world governance, humans should understand the systems within which we exist, and systems that we consist of and that we create. It is important due to the known fact that any system in nature will remain as it is, as long as all systems and relations within it are in a similar mode. Together they make a living system that is trying to be a viable system. If and when any major or minor part of the system moves, changes, whole system will



commence to move, change. It is not possible to predict in which direction the system will move, change. This is what is happening with the climate change system. It is maybe the answer to what is faced by human society now.

Otherwise, the climate change system ultimately would change living conditions within the biosphere and nature of the Earth so much that our civilization will end. Therefore we are

13. Recommending

- *One planet, one government* is our first recommendation. Of course, The Planet Earth Federation Constitution – honest to all and requisitely holistic – is the first step, and The Planet Earth Parliament and Government follow in line, after ratification of The Planet Earth Federation Constitution.

- Secondly, we recommend a new – requisitely holistic approach to the *social order*, which has to reflect the present experience, and the establishment of a *new contract for humankind* living on the planet Earth. The goal is to prevent explosion of humankind reproduction, enforce ethics of interdependence and tolerance amongst peoples of the Earth, enforces (a globally holistic!) law and order. A requisitely holistic and skilful governing should allow the coming generations to live and have sustainable future²¹ on the planet Earth.

- Thirdly, we recommend *redirections of scientific work* from war armaments, too narrowly market-oriented and synthetic chemicals technologies, etc., to discovering viable global systems of nature, space, the environment and cosmos, as essential elements of knowledge needed for survival and sustainable future of mankind.

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²¹ Sustainable future of mankind is harmony of our civilization and the Nature/Biosphere of The Planet Earth (Ecimovic, 2006).