

**TITOLU TAL- KORS:** METODI PARTEĊIPATORJI FIL-ĠESTJONI SOSTENIBBLI TAR-RIŻORSI NATURALI

**ORGANIZZAZZJONIJIET PARTEĊIPANTI:** UNIVERSITÀ TA' IOANNINA U L-UNIVERSITÀ TA' NAPLI FEDERICO II

**DESKRIZZJONI:** Jeżisti interess dejjem jikber fl-użu ta' approċċi parteċipatorji fil-ġestjoni sostenibbli tar-riżorsi naturali. Attivitàjiet ta' riċerka huma ġeneralment meqjusa bħala ġabra ta' kunċetti u prattiki li jippermettu liċ-ċittadini biex itejjbu l-għarfien tagħhom għall-iżvilupp sostenibbli. Dan il-kors jipproponi l-użu ta' studji ta' każijiet li fihom l-approċċi parteċipattivi kellhom suċċess jew iltaqgħu ma' xi ostakoli ta' naturi differenti bħala materjal ta' tagħlim. Il-metodi tal-xjenzi soċjali u r-riċerka kwalitattiva huma diskussi fil-kors ibda minn analiżi kritika ta' dawn l-istudji ta' każijiet. L-għan tal-kors huwa li jiżviluppa kompetenzi trasversali fix-xjenza, fix-xjenzi ekonomiċi u soċjali għal edukazzjoni li jinvolvu n-nies bħala ċittadini. L-istudenti ġejjin minn dixxiplini differenti jitgħallmu jaġħrfu l-komplessità ta' bosta fenomeni u jintegrawh ma' għarfien kritiku. L-attivitàjiet ta' tagħlim se jkunu ffokati fuq li trattament ta' problemi reali u l-valutazzjoni kritika tal-konsegwenzi ta' soluzzjonijiet differenti. L-għalliema se jassumu rwoli differenti fl-istess attività: esperti, għaliex huma studjaw l-problema qabel; stimulatori, kapaċi li jistimalaw l-opinjoni differenti; riċerkaturi, kapaċi li jorganizzaw u jipproduċu analiżi ddokumentata tal-proċessi ta' tagħlim u t-tagħlim. Il-kors ser jiddependi fuq studji ta' każijiet dwar sitwazzjonijiet problematiċi ta' interess fl-edukazzjoni ambjentali u żvilupp sostenibbli. Il-kors jindirizza studenti minn korsijiet ta' gradi differenti, għalliema fl-iskejjel u l-edukaturi li jaħdmu fl-istituzzjonijiet lokali u se jsiru f'postijiet differenti: universitajiet, skejjel u mużewijiet biex jilħqu l-pubbliku ġenerali. Il-valutazzjoni hija formattiva, tipprova tiżviluppa, in itinere, il-hila biex l-istudent janalizza u jiddokumenta l-fenomeni ta' interess ambjentali.

KORS X	ECTS	KONTENUT	METODU/ GħODDA
<b>Modulu 1</b>	3	Suġġett 1: Riċerka ta' Azzjoni, reflexivity u metodi parteċipattivi Suġġett 2: Analizi ta' Studju ta' Każ	Wiċċ imb'wiċċ / Laboratorji
<b>Modulu 2</b>	3	Suġġett 3: Kompetenzi trasversali fl-edukazzjoni ambjentali Suġġett 4: Komplessità tal-bijodiversità u l-impatti fuq il-komunitajiet lokali	Wiċċ imb'wiċċ / Laboratorji
<b>Modulu 3</b>	3	Suġġett 5: Ideat ewlenin u l-kunċetti trasversali fl-edukazzjoni xjentifika Suġġett 6: Sistemi kumplessi	Wiċċ imb'wiċċ / Laboratorji
<b>Studju ta' kaz</b>	6	Suġġett 7: Riċiklaġġ u l-ġestjoni sostenibbli tar-riżorsi naturali	Wiċċ imb'wiċċ / Laboratorji / Fieldwork

**KORS 1. Metodi parteċipattivi fil-ġestjoni sostenibbli tar-riżorsi naturali.**

Titlu	Deskrizzjoni
Livell	
Semestru	
ECTS	15
lingwa tat-tagħlim	Ingliz
Numru ta' lectures	7
Numru ta' laboratorji	8
Homework	IVA
Laqgħat / tutorja	LE
Għanijiet tal-kors	Biex jiġu żviluppati kompetenzi trasversali fix-xjenza, ix-xjenzi ekonomiċi u soċjali għal edukazzjoni li jinvolvi n-nies bħala ċittadini; biex jistimulaw istudenti li ġejjin minn dixxiplini differenti li jirrikonoxxu l-kumplessità ta' bosta fenomeni b'għarfien integrat kritiku, li jitrattaw problemi reali u biex tevalwa b'mod kritiku l-konsegwenzi ta' soluzzjonijiet differenti.
Kontenut tal-kors	Riċerka ta' azzjoni, metodi parteċipattivi u analiżi ta' studju ta' każ; kompetenzi trasversali fl-edukazzjoni ambjentali, il-kumplessità tal-bijodiversità u l-impatti fuq il-komunitajiet lokali; ideat ewlenin u kunċetti trasversali fl-edukazzjoni xjentifika; riċiklaġġ u ġestjoni sostenibbli tar-riżorsi naturali.
Valutazzjoni	L-evalwazzjoni ser tkun ibbażata fuq attendenza (30%); parteċipazzjoni u l-assenjazzjoni fil-laboratorji, attivitajiet tat-tim u workshops (40%); assenjazzjoni miktuba u orali fl-analiżi ta' istudju tal-każ (30%).

MODULU 1

Titlu	Description
Livell	
Semestru	
ECTS	3
lingwa tat-tagħlim	Ingliz
Numru ta' lectures	2
Numru ta' laboratorji	2
Homework	Iva
Laqgħat / tutorja	Le
Għanijiet tal-kors	Introduzzjoni għall-istrateġiji ta' riċerka kwalitattiva u metodi parteċipattivi; biex japplikaw ir-riċerka u l-analiżi studju ta' każ li l-ġestjoni sostenibbli tar-riżorsi naturali.
Kontenut tal-kors	Prinċipji bażiċi ta' azzjoni ta' riċerka u tipi oħra ta' metodi parteċipatorji (tagħlim fil-komunità, timijiet u attivitajiet kollaborattivi, metodi viżwali parteċipattivi); prattiki riflettivi fl-edukazzjoni; Analizi ta' studju ta' każ.
Valutazzjoni	L-evalwazzjoni ser tkun ibbażata fuq attendenza (40%); parteċipazzjoni u assenjazzjoni bil-miktub u orali fil-laboratorji u homework (60%).

MODULE 2

Titlu	Description
Livell	
Semestru	
ECTS	3
lingwa tat-tagħlim	Ingliz
Numru ta' lectures	1
Numru ta' laboratorji	2
Homework	Iva
Laqgħat / tutorja	Le
Għanijiet tal-kors	Biex jiġu żviluppati kompetenzi multidixxiplinarji u trasversali fl-edukazzjoni ambjentali; sabiex jellabora approċċ kritiku lejn il-kwistjonijiet ambjentali li jistgħu jirrikonoxxu l-komplessità ta' bosta fenomeni u l-impatti tagħhom fuq il-komunitajiet lokali.
Kontenut tal-kors	Konnessjonijiet bejn ix-xjenzi naturali u x-xjenzi soċjali fl-edukazzjoni ambjentali; kumplessità tal-idea tal-bijodiversità u l-impatti tal-bidliet ambjentali fuq komunità lokali; indirizzar tal-bżonnijiet ta' nies issa u fil-futur.
Valutazzjoni	L-evalwazzjoni ser tkun ibbażata fuq attendenza (40%); parteċipazzjoni, assenjazzjoni orali u bil-miktub f'laboratorji u homework (60%).



MODULU 3

Titlu	Description
Livell	
Semestru	
ECTS	3
lingwa tat-tagħlim	Ingliz
Numru ta' lectures	3
Numru ta' laboratorji	1
Homework	Le
Laqgħat / tutorja	Le
Għanijiet tal-kors	Li jifformula l-perspettiva tal-edukazzjoni ambjentali; biex jinkoraġġixxi lill-istudenti biex jadottaw approċċi ta' sistema kumplessa li tinvolvi xjenza, l-edukazzjoni tax-xjenza ekonomika u soċjali.
Kontenut tal-kors	Introduzzjoni għall-ideat ewlenin minn dixxiplini differenti li jagħmlu referenza għal-rilevanza tagħhom fil-kwistjonijiet relatati mal-ambjent. Diskussjoni tar-rilevanza ta' ideat ewlenin dixxiplinari fi ħdan il-qafas tal-kwistjonijiet ambjentali b'referenza għall-għarfien, l-esperjenzi tal-istudenti u l-isfond kulturali. Prezentazzjoni ta' sistemi kumplessi b'approċċ b'referenza mat-tifsira tiegħu u l-valur għall-analiżi ta' kwistjonijiet ambjentali. Diskussjoni tal-idea ta' sistema kumplessa fir-rigward mal-applikazzjoni tagħha għall-xjenzi ekonomiċi u soċjali.
Valutazzjoni	L-evalwazzjoni ser tkun ibbażata fuq attendenza (40%); parteċipazzjoni u l-assenjazzjoni fil-laboratorji (60%).

MODULU 4 – STUDJU TA' KAZ

Titlu	Description
Livell	
Semestru	
ECTS	6
lingwa tat-tagħlim	Ingliz
Numru ta' lectures	1
Numru ta' laboratorji	3
Homework	Iva
Laqgħat / tutorja	Le
Għanijiet tal-kors	Analizi ta' każ ta' emerġenza fil-ġestjoni tal-iskart, tqabbil tas-soluzzjonijiet proposti u implimentati, identifikazzjoni tal-konsegwenzi ambjentali, ekonomiċi, soċjali u kulturali tagħhom, elaborazzjoni ta' proġetti innovattivi u sostenibbli.
Kontenut tal-kors	Analizi tal-isfond ffukat fuq l-atturi differenti tax-xenarju deskritt ( gvern u awtoritajiet lokali; abitanti). Analizi kritika tal-politiki implimentati u l-effetti tagħhom. Elaborazzjoni ta' soluzzjonijiet sostenibbli differenti.
Valutazzjoni	L-evalwazzjoni ser tkun ibbażata fuq attendenza (40%); parteċipazzjoni, assenjazzjoni bil-miktub u orali f'laboratorji u homework (60%).



## KORS 1. Metodi parteċipattiva fil-ġestjoni sostenibbli tar-riżorsi naturali

### MODULU 1 - HANDOUT

<p><b>Introduzzjoni</b></p>	<p>L-għan ta' dan il-modulu huwa li jgħin lill-istudenti biex jibnu kompetenzi speċifiċi fi ħdan strateġiji ta' riċerka kwalitattiva u metodi parteċipattivi sabiex jiġu applikati fl-oqsma tar-riċerka u l-edukazzjoni relatati mal-ġestjoni sostenibbli tar-riżorsi naturali.</p> <p>Il-modulu jipprovdi introduzzjoni għall-prinċipji bażiċi ta' azzjoni ta' riċerka, l-analiżi ta' studju ta' każijiet u tipi oħra ta' metodi parteċipattivi li llum huma meqjusa bħala gabra ta' kunċetti u Prattiki li jippermettu liċ-ċittadini biex itejbu l-għarfien tagħhom fuq l-iżvilupp sostenibbli.</p> <p>Bl-għan li l-klassi grupp tkun tip ta' 'komunità, i.e. ambjent miftuħ u demokratiku fejn kulhadd huwa kapaċi li jikkontribwixxi għall-proċess tat-tagħlim, Modulu 1 iżid l-għarfien tal-istudenti fir-rigward tal-valur tax-xogħol reċiproku bejn l-għalliema u l-istudenti u l-importanza ta' ħidma flimkien sabiex jippromwovi l-bidla soċjalilejn żvilupp sostenibbli. Parti integrali ta' dan it-tip ta' approċċ parteċipattiv għar-riċerka u l-edukazzjoni huwa stress fuq reflexivity, dan ifisser il-kapaċità tal-istudenti li jiffokaw fuq l-attitudnijiet pre-eżistenti tagħhom, l-esperjenzi u t-twelmin tagħhom u jiddibatti ma' studenti u għalliema oħra. Wara l-introduzzjoni fil-fond għall-analiżi ta' azzjoni ta' riċerka u studju ta' każijiet, l-istudenti se jkunu stimulati biex isibu applikazzjoni Prattika ta' dawn il-metodoloġiji, b'mod partikolari fir-rigward tar-riċerka u l-edukazzjoni ambjentali u għall-ġestjoni sostenibbli tar-riżorsi naturali.</p>
<p><b>Task description</b></p>	<p><b>Lecture:</b> Introduzzjoni qasira għall-prinċipji bażiċi u tipi differenti ta' metodi parteċipattivi. L-istudenti se jkunu familjari mal-Prattika riflettiva fl-edukazzjoni u mhegga jaħsbu dwar il-proċess ta' tagħlim, fuq it-twelmin pre-eżistenti stabbiliti fit-tagħlim u kif inaqqsu s-separazzjoni bejn it-teorija u l-Prattika fil-kuntest edukattiv. Wara introduzzjoni qasira għar-riċerka ta' azzjoni u l-proċess ta' riċerka speċifika relatata ma' dan l-approċċ metodoloġiku, l-istudenti se jkollhom l-oportunità li jiddiskutu tipi oħra ta' metodi parteċipattivi, bħat-tagħlim tal-komunità, timijiet u attivitajiet kollaborattivi jew metodoloġiji speċifiċi oħra. Meta tqabbel tipi differenti ta' metodi parteċipattivi u Prattiki differenti, dawn se jkunu kapaċi jkabblu l-għodod u jiddiskutu l-kapaċità tagħhom li tippermetti lin-nies biex jieħdu azzjoni biex isolvu problemi tagħhom stess jew jiġu kkomunikati lil min jieħdu d-deċiżjonijiet, komunitajiet lokali jew opinjonijiet pubbliki.</p> <p><b>Lecture:</b> Introduzzjoni ta' analiżi ta' studju ta' każ, approċċ multidimensjonali u olistiku lejn suġġetti li jistgħu jinkludu avvenimenti, perjodi, proġetti, linji politiċi, istituzzjonijiet jew sistemi kumplessi sabiex jiġi indirizzat każ speċifiku li jirrappreżenta kampjun ta' oġġett teoretiku. L-analiżi ta' xi każijiet Prattiki jstimula l-istudenti biex jinvestigaw fenomeni jew klassi ta' fenomeni fi ħdan kuntesti tal-ħajja reali u jhegghiġhom biex jikkunsidraw soluzzjonijiet alternattivi imma realistiċi sabiex isolvu problemi speċifiċi. L-istadji differenti tal-analiżi tal-każ ta' studju se jiġu spjegati: deskrizzjoni tal-isfond u l-kuntest; għażla ta' fatti u kwistjonijiet rilevanti; il-</p>



	<p>problemi ewlenin; l-evalwazzjoni tal-impatti fuq in-nies u l-ambjent; identifikazzjoni ta' dawk li jieħdu d-deċiżjonijiet u l-istrategiji implimentati; soluzzjonijiet alternattivi possibbli (u eventwalment għaliex ġew rifjutati); għażla tal-aħjar u l-aktar soluzzjoni effettivi u diskussjoni msejjsa fuq l-evidenza. Importanza partikolari ser titqiegħed fuq is-sorsi multipli ta' prova wżati fi studju (taħlita ta' evidenza kwantitattiva u kwalitattiva), fuq il-vantaġġi u l-isfidi tal-użu ta' studji ta' każijiet, kif il-każ istudju jista' jintuża bħala għodda ta' taġħlim għax dan jippermetti lill-istudenti jieħdu sehem b'mod dirett fid-diskussjoni ta' studji ta' każijiet reali u jitgħallmu permezz ta' kooperazzjoni, u billi jieħdu rwoli fi proċess simili.</p> <p><b>Laboratorju 1:</b> Il-laboratorju ser ikun ffukat fuq l-istudju tal-każ "Tkessiħ ta' Pjaneta li Qed Tišhon: Analizi ta' tradeoffs fil-politiki għall-bidla fil-klima"; l-istudenti se janalizzaw dan il-każ skond il-metodoloġija tat-taġħlim ta' qadi tar-rwoli.</p> <p><b>Laboratorju 2: Studju tal-Każ miktub.</b></p> <p><b>Assenjazzjonijiet :</b></p> <ul style="list-style-type: none"> <li>- <b>Homework:</b> Mistoqsijiet relatati mal-ambjent se jiġu pprezentati lill-istudenti biex isibu applikazzjoni Prattiki ta' teoriji diġà diskussi. L-istudent ser jagħmel metodi parteċipattivi speċifiċi biex isolvi każ ambjentali partikolari, jispjega l-għażla u jiddiskuti dan ma' studenti oħra u mal-għalliem.</li> <li>- <b>Laboratorju 1:</b> Il-kompitu tal-istudenti jkun li jikkontribwixxi b'mod kollettiv għall-iżvilupp tad-dikjarazzjoni politika; kull membru tal-grupp se jirrappreżenta wieħed mill-erba' karattri differenti mfassla fuq fatti reali, opinjonijiet, u tħassib dwar kif għandhom jiġu indirizzati l-konsegwenzi ekonomiċi, ambjentali, soċjali, u politiki tal-leġiżlazzjoni tat-tibdil fil-klima.</li> <li>- <b>Laboratorju 2:</b> L-istudenti se jkunu mitluba li jiktbu studju ta' każ ta' episodji jew politiki marbuta ma' kwistjonijiet ambjentali magħrufa. Kull grupp se jipprovdi testi, evidenzi u materjali oħra sabiex tinbena għodda ta' taġħlim, tajbin għall-edukazzjoni ambjentali sabiex jissottomettu ruħhom għal klassi immaġinarja ta' studenti.</li> </ul>
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## MODULU 2 - HANDOUT

<b>Introduzzjoni</b>	<p>L-għan ta' Modulu 2 huwa li jiġu żviluppati kompetenzi transversali fl-edukazzjoni ambjentali, integrazzjoni ta' ħiliet u approċċi minn dixxiplini differenti fix-xjenza u f'ix-xjenzi ekonomiċi u soċjali. L-edukazzjoni ambjentali tista' biss effettivament teżercita lin-nies bħala ċittadini attivi jekk jitgħallmu jagħrfu l-komplessità ta' fenomeni ambjentali. Għalhekk, trattament ta' problemi ambjentali reali tfisser li jiġi adottat approċċ olistiku li jikkonsisti f'analizi fil-fond tal-kawżi tal-problemi ambjentali u evalwazzjoni kritika tal-konsegwenzi tas-soluzzjonijiet fil-prattika. Dawn iż-żewġ fatturi jinkludi l-konsiderazzjoni ta' kwistjonijiet ambjentali fuq komunitajiet lokali. Stimulati biex jadottaw perspettiva aktar komplessi dwar materji ambjentali jgħin biex l-istudenti jmorru lil hinn minn idea ġenerika tal-edukazzjoni u s-sensittività għall-iżvilupp sostenibbli. Approċċ multidixxiplinarju għall-edukazzjoni ambjentali tinkoraġġixxi l-partecipanti biex iħaddnu viżjoni globali u dettaljata ta' dak li tfisser li teduka lin-nies sabiex jgħixu b'rispett lejn l-ambjent, li jippreservawha jew li jaġixxu fuqha, u li tinkludi referenza għal kwistjonijiet soċjali, kulturali kif ukoll ekonomiċi.</p>
<b>Deskrizzjoni</b>	<p><b>Lecture:</b> Introduzzjoni għall-metodi olistiċi ta' sostenibbiltà bbażati fuq ir-rikonoxximent ta' erba' kategoriji ta' interventi: ambjentali, ekonomiċi, soċjali u kulturali u spjegazzjoni tal-konnessjonijiet bejn ix-xjenzi naturali u x-xjenza soċjali fl-oqsma ta' riċerka relatati mal-iżvilupp sostenibbli. L-istudenti se jkun fuq familjari mal-idea li trattament tal-isfidi globali tfisser integrazzjoni tat-tħassib tal-ekonomija, l-ambjent, is-soċjetà u l-wirt kulturali. Żvilupp sostenibbli effettiv, li tal-inqas tfisser li tillimita d-danni kkawżati mit-tkabbir, għandha dejjem tibda mill-preżunzjoni sempliċi li s-soċjetà hija sistema ntegrata. Fehim integrat tal-fatturi soċjali, kulturali u ekonomiċi multipli relatati ma' kwistjonijiet ambjentali għandu jkollu attenzjoni ddettaljata dwar ir-rwol li, f'kull post speċifiku, li dawn il-fatturi għandhom li jipprevjenu jew jippromwovu bidliet soċjali mmirati li jipprovdu stili ta' ħajja aktar b'saħħithom.</p> <p><b>Laboratorju 1:</b> Diskussjoni u dibattitu: politiki sostenibbli vs greenwashing.</p> <p><b>Laboratorju 2:</b> Tivvaluta l-impatt ambjentali u terġa' tifformula l-bijodiversità.</p> <p><b>Assenjazzjonijiet :</b></p> <ul style="list-style-type: none"> <li>- <b>Homework:</b> Riċerki online mmirata lejn l-identifikazzjoni ta' interventi ambjentali f'postijiet u żoni differenti.</li> <li>- <b>Laboratorju 1:</b> Il-partecipanti se jintalbu jagħrfu, fost l-interventi ambjentali identifikati, l-interventi reali orjentati lejn is-sostenibbiltà għal dawk ta' "green-washing", jiddiskutu l-opinjoni tagħhom ma' studenti u għalliema oħra, u jenfasizzaw l-fatturi differenti (soċjali, ekonomiċi, kulturali) tal-problema ambjentali f'kull każ.</li> </ul>



	<p>- <b>Laboratorju 2:</b> Wara l-wirja ta' dokumentarji jew films qosra, l-istudenti se jkunu mitluba li janalizzaw l-impatt tal-kriżi ambjentali fuq il-komunitajiet lokali jew eżempji (tradizzjonali u ġodda) ta' integrazzjoni pożittiva tas-soċjetà u l-ambjent skond il-materjal viżiv sottomess. Dawn se jlaboraw l-idea ta' bijodiversità li jinvolvu mhux biss l-għarfien tax-xjenza, iżda wkoll is-sejbiet tal-ekonomija u x-xjenza soċjali f'dan il-qasam.</p>
<b>Referenzi</b>	<p>Ardoyn, N.M., Clark, C., &amp; Kelsey, E. (2013) An exploration of future trends in environmental education research, <i>Environmental Education Research</i>, 19: 4, 499-520.</p> <p>Bachiorri, A., Puglisi, A. &amp; Giombi, G. (2009) <i>Environment, our common future: Exploring students' perceptions in an environmental education framework. Abstract book of the 5th World Environmental Education Congress</i>, Montreal, Canada</p> <p>Krasny, M. &amp; Dillon, J. (eds.) (2012) <i>Trading zones in environmental education: Creating transdisciplinary dialogue</i>. NewYork: Peter Lang.</p> <p>NAAEE (1996) <i>Environmental education materials: Guidelines for excellence</i>. Washington: North American Association for Environmental Education</p> <p>Russo Krauss, P., (2008) <i>Ecolandia – Principi, metodologia e didattica dell'educazione ambientale</i>. Napoli: Edizioni Stagrame</p> <p>Sauvé, L., (2005) Currents in environmental education: Mapping a complex and evolving pedagogical field. <i>Canadian Journal of environmental education</i>, 10: 1, 11-37.</p> <p>WEEC. <i>World Environmental Education Congress</i>  <a href="http://www.environmental-education.org">http://www.environmental-education.org</a></p>

### HANDOUT – Modulu 3

<p><b>Introduzzjoni</b></p>	<p>Sabiex jiġu żviluppati kompetenzi sinifikanti fi ħdan il-qafas wiesa' ta' kwistjonijiet ambjentali, Modulu 3 jistimula xi bidliet fil-perspettivi dwar l-ambjent u l-ġestjoni tiegħu. Din il-ħtieġa għal bidla fil-perspettiva hija l-idea ewlenija li fuqha huwa bbażat l-paradigma tal-edukazzjoni ambjentali: l-użu tal-kompetenzi xjentifiċi fit-trattament tal-ambjent ma jstax jfisser sempliċement li tadatta l-kontenuti dixxiplinaru xjentifiku għall-istudju ta' din is-sistema speċifika; minflok l-ambjent għandu jitqies bħala sistema kumplessa li tista' tiġi ttrattata biss permezz ta' taħlita raġonevoli ta' dixxiplini differenti li għandhom jiġu ntegrati ma' xulxin u li jorbtu ma' kwistjonijiet soċjali, kulturali u ekonomiċi. F'dan is-sens ix-xjenza ambjentali għandha tiġi kkunsidrata bħala dixxiplina ġdida fjamanta li għandha kontenut u metodoloġiji speċifiċi tagħha. Din id-dixxiplina ġdida fjamanta għandha tinbena minn serje ta' ideat ewlenin minn dixxiplini xjentifiċi tradizzjonali fid-dawl ta' aktar kunċetti transdixxiplinari (i.e. sistemi interattivi, trasformattivi, konservazzjonisti).</p>
<p><b>deskrizzjoni</b></p>	<p><b>Lecture:</b> Introduzzjoni għall-ideat ewlenin fid-dawl ta' kunċetti trasversali. Ideat ewlenin minn dixxiplini differenti huma introdotti permess ta' referenza għar-rilevanza tagħhom fi kwistjonijiet relatati mal-ambjent. Eżempji ta' ideat ewlenin jistgħu jkunu dawk tal-materja, forza, enerġija jew entropy fil-fizika, atomu, molekula, bond jew reazzjoni fil-kimika, ċelluli, l-istruttura, il-funzjoni jew ekosistema fil-bijoloġija. Min-naħa waħda, dawn l-ideat ewlenin jistgħu ikunu diskussi b'analoġiji u d-differenzi fit-tifsira tagħhom fid-dixxiplini differenti; minn naħa l-oħra dawn jistgħu jiġu riveduti u miġjuba għal livell aktar ġenerali u ħolistiku b'interpretazzjoni mill-ġdid u t-tħaddim tagħhom fid-dawl ta' kunċetti trasversali bħala sistemi, interazzjonijiet, trasformazzjonijiet, konservazzjoni, u irriversibilità.</p> <p><b>Laboratorju:</b> Reflexivity u edukazzjoni ambjentali: jiddiskuti r-relevanza ta' ideat ewlenin dixxiplinari biex jiffaċċjaw kwistjonijiet ambjentali b'referenza għall-għarfien, esperjenzi u l-isfond kulturali tal-istudent.</p> <p><b>Lecture:</b> Sabiex jiġu riveduti il-kontenut ta' qabel fid-dawl tal-approċċ ta' sistemi kumplessi, dawn se jiġu ppreżentati b'referenza għat-tifsira tagħhom u l-valur tagħhom għall-analiżi ta' kwistjonijiet ambjentali. Attenzjoni partikolari ser tkun iffokata fuq id-deskrizzjoni ta' sistema kumplessa bħala magħmula minn partijiet żgħar fejn l-interazzjoni tagħhom jistgħu jagħtu lok għal imġieba kollettivi emergenti, li mhux predeterminat, prevedibbli biss fuq bażi ta' statistika u li huwa determinati biss b'modi li bihom is-sistema kumplessa tinteraggixxi mal-ambjent kollu kemm hu ta' madwarha.</p> <p><b>Lecture:</b> Tħaddim tal-użu tal-approċċ tas-sistema kumplessa fix-xjenzi naturali mal-użu tiegħu fl-xjenzi ekonomiċi u soċjali u żvilupp ta' approċċ ġdid fjamant għall-kwistjonijiet ambjentali, l-idea ta' sistema kumplessa ser tkun diskussa f'relazzjoni mal-applikazzjoni tagħha għall-xjenzi ekonomiċi u</p>





	<p>soċjali.</p> <p>L-approċċ ta' sistemi kumplessi mbagħad jiġu riveduti fid-dawl tal-possibbiltà li jintużaw bħala approċċ transdixiplinarju ġenerali għall-istudju dwar kwistjonijiet ambjentali li jistgħu jwasslu lill-istudenti biex jiżviluppaw għarfien fil-fond tal-kumplessità enormi ta' dawn il-kwistjonijiet u torbot l-għarfien u il-ħiliet li huma żviluppaw li jagħmluhom kapaci jagħmlu deċiżjonijiet li huma informati u responsabbli mil-lat soċjo-ekonomiku. Ser tingħata attenzjoni wkoll sabiex ssir diskussjoni mal-istudenti fuq l-idea ġenerali tagħhom ta' dak li hija x-xjenza u jippruvaw li jmorru fid-direzzjoni tal-inkluzjoni fil-perspettiva xjentifika tal-aspettattivi u l-ħtiġijiet li ġejjin minn kull wieħed minna bħala bnedmin li jixtiequ jippreservaw l-ambjent li jgħixu fih.</p> <p><b>Assenjament :</b></p> <ul style="list-style-type: none"> <li>- <b>Laboratorju 1:</b> L-istudenti se jiġu mistiedna biex jiddiskutu r-rilevanza tal-ideat ewlenin dixiplinari sabiex jiffaċċjaw kwistjonijiet ambjentali b'referenza għall-għarfien tagħhom, l-esperjenzi u l-isfond kulturali. Imbagħad, l-istudenti huma mistiedna biex jibnu argumenti dwar ir-rilevanza ta' ideat ewlenin fid-diskussjoni b'modi biex jisfruttaw, jimmaniġġjaw u jippreservaw l-ambjent.</li> </ul>
<b>Referenzi</b>	<p>NECSI – New England Complex Systems Institute. (<a href="http://necsi.edu">http://necsi.edu</a>)</p> <p>Naeer Bar-Yam, Dynamics of complex systems. Addison-Wesley, Reading, Massachusetts, 1997. <a href="http://necsi.edu/publications/dcs/Bar-YamTOC.pdf">http://necsi.edu/publications/dcs/Bar-YamTOC.pdf</a></p> <p>NICO - Northwestern Institute on Complex Systems, Northwestern University, IL, USA. <a href="http://www.nico.northwestern.edu/">http://www.nico.northwestern.edu/</a></p> <p>YouTube channel collecting NICO seminars on complex systems. <a href="https://www.youtube.com/channel/UC7OtqKhLoQVH2WBnyBpDK1g">https://www.youtube.com/channel/UC7OtqKhLoQVH2WBnyBpDK1g</a></p> <p>Vermont Complex Systems Center, University of Vermont, USA. <a href="http://www.uvm.edu/~cmplxsys/blog/">http://www.uvm.edu/~cmplxsys/blog/</a></p> <p>Materials from the lectures of the Principles of Complex Systems course with Professor Peter Dodds. <a href="http://www.uvm.edu/~pdodds/teaching/courses/2013-08UVM-300/content/lectures.html">http://www.uvm.edu/~pdodds/teaching/courses/2013-08UVM-300/content/lectures.html</a></p>



#### HANDOUT – Modulu 4 –STUDJU TA' KAZ

<p><b>Introduzzjoni</b></p>	<p>Il-modulu jibda minn deskrizzjoni ġenerali tal-kunċetti bażiċi tal-politiki moderni ta' ġestjoni tal-iskart, li huma msejsa fuq l-hekk imsejha "3 Rs": (<i>Reduce, Reuse, Recycle</i>) Naqqas, Użu mill-ġdid, Riċiklu. Il-kwistjoni ta' ġestjoni tal-iskart hija pprezentata bil-piramida ta' ġerarkija tal-iskart, tagħmel wkoll referenza tal-aspetti legali tagħha u anki għal dawk l-aspett li huma marbutin sew ma' sostenibbiltà, bħall-ċikli tal-ħajja tal-prodotti u l-azzjonijiet immirati lejn l-irkupru tar-rizorsi.</p> <p>Ladarba tkun miksuba perspettiva ġenerali dwar il-ġestjoni tal-iskart, il-modulu jibdel l-attenzjoni fuq l-studju tal-każ emblematicu li kien fil-mira tal-attenzjoni tal-media tad-dinja kollha: l-emerġenza tal-iskart fir-reġjun tal-Kampanja fl-Italja t'Isfel.</p> <p>L-emerġenza tal-iskart fil-Kampanja kienet sintomatika ta' użu ħażin tar-rizorsi naturali, iżda wkoll ta' nuqqas ta' demokrazija peress li awtoritajiet nazzjonali u lokali dehru li mhumix lesti li jstimulaw proċessi ta' ċittadinanza attiva biex tasal għal soluzzjonijiet. Il-gvern kellu juża' forza militari biex iċ-ċittadini jaċċettaw il-ħolqien ta' impjanti godda ta' eliminazzjoni u l-ipproċessar ta' skart, incineraturi jew saħansitra miżblat fit-territorju tagħhom: bħala konsegwenza il-politiki adottati mhux biss ma setgħux isolvu l-kriżi, iżda wkoll żiedu l-inkwiet pubbliku u aggrawaw il-kunflitt.</p> <p>L-emerġenza tal-iskart żvelat l-periklu impliċitu ta' nuqqas ta' adozzjoni ta' Sistema Ġestjoni tal-iskart Solidu Integrat, u ukoll għamlet ċar l-involvement ta' organizzazzjonijiet kriminali fil-industrija tal-ġestjoni tal-iskart. L-hekk imsejha "Art ta' Nirien" huwa qasam fil-Campania fejn sa mill-aħħar tas-snin 80, skart tossiku kienu dumped mill-kriminalità organizzata.</p> <p>Madankollu, effett mhux mistenni u indirett tal-emerġenza tal-iskart hija kuxjenza ġdida mifruxa fl-abitanti tar-reġjun tal-Kampanja dwar l-impatti soċjali u danni ambjentali dejjiema li jistgħu jidderivaw minn użu ħażin tar-rizorsi naturali jew minn ġestjoni żbaljata tal-iskart, u din kabbret is-sensittività għall-iżvilupp sostenibbli. Wara s-sena 2008 ħarġu tipi differenti ta' esperjenzi (movimenti soċjali, kooperattivi, assoċjazzjonijiet, eċċ) bl-għan li jippromwovu u li jipprattikaw ġestjoni u sostenibbli tar-rizorsi naturali u l-iskart solidu urban.</p> <p>L-analiżi tal-istudju tal-każ se jiffoka fuq l-atturi li jilagħbu fit-xenarju deskritt hawn fuq: l-awtoritajiet amministrattivi tal-gvern u lokali; istitut nazzjonali tas-saħħa u l-awtoritajiet tas-saħħa lokali; assoċjazzjonijiet u organizzazzjonijiet tal-abitanti. B'mod partikolari, tiffoka fuq is-soluzzjonijiet proposti jfasslin kemm mill-politika u l-organizzazzjonijiet taċ-ċittadini, jippruvaw li jstimulaw, b'mod parteċipattiv attitudni għall-analiżi komparattiva u kritika ta' impatti, konsegwenzi, problematiċi u l-vantaġġi derivati mit-tnejn.</p>
<p><b>Descrizzjoni</b></p>	<p><b>Lecture:</b> Introduzzjoni tal-kunċetti bażiċi tal-politiki moderni ta' Ġestjoni tal-iskart. Descrizzjoni qasira tal-istudju tal-każ "Kampanja Emerġenza Skart". Analiżi ta' xhieda dwar l-effetti tal-akkumulazzjoni tal-iskart f'termini ta' kontaminazzjoni tal-ħamrija, l-ilma u l-arja. Analiżi ta' linji gwida għall-</p>



	<p>approċċ tal-istudju tal-każ u jiġu ċċarati l-passi li l-istudenti għandhom jieħdu biex janalizzaw il-każ .</p> <p><b>Laboratorju 1 - Role play</b></p> <p><b>Laboratorju 2 – Soluzzjonijiet alternattivi</b></p> <p><b>Laboratorju 3 – Fieldwork: prattiki tajbin fl-riċiklaġġ u l-ġestjoni sostenibbli tar-riżorsi naturali fil-Kampania</b></p> <p><b>Assenjament :</b></p> <ul style="list-style-type: none"> <li>- <b>Homework:</b> L-istudenti se jkollhom il-ħin sabiex jaqraw u jaħsbu individwalment dwar il-każ u jipprovaw iwieġbu xi mistoqsijiet bażiċi proposti mill-għalliema fil-introduzzjoni tiegħu / tagħha għall-kawża (problema ċentrali (i); kors possibbli ta' azzjoni, ostakli potenzjali (i)?)</li> <li>- <b>Laboratorju 1 – Role play:</b> Il-klassi tinqasam fi gruppi u jiġu assenjati rwoli jew pożizzjonijiet speċifiċi: l-għan tal-attività hija biex il-każ jinqasam f'ħafna partijiet, filwaqt li jiġi enfasizzati l-opinjoni differenti tal-atturi involuti fil-każ jew fid-diversi livelli ikkunsidrati tal-impatt tal-problema (ekonomiku, soċjali, kulturali).</li> <li>- <b>Laboratorju 2 – Tfittix ta' soluzzjonijiet alternattivi :</b> Nofs il-klassi ser jiġi pprovdut bi ftit studji żgħar dwar każijiet veri implimentati fir-reġjun tal-Kampania wara l-emerġenza tal-iskart iffukati fuq proġett sostenibbli tal-ġestjoni tal-iskart; in-nofs l-ieħor jipprova jelabora soluzzjonijiet innovattivi ambjentali u jiġu identifikati wkoll il-konsegwenzi tal-applikazzjoni tagħhom fil-kuntest tal-każ. L-istudenti jipprezentaw il-każijiet jew soluzzjonijiet tagħhom lill-klassi u finalment jiddiskutuhom.</li> <li>- <b>Laboratorju 3 – Fieldwork:</b> L-istudenti se jkollhom iċ-ċans li jesperjenzaw prattiki tajbin fil-riċiklaġġ u l-ġestjoni sostenibbli tar-riżorsi naturali f'reġjuni minn fejn jabitaw l-istudenti. Huma se jżuru numru ta' organizzazzjonijiet u assoċjazzjonijiet kemm immirati lejn kampanja ta' għarfien fis-sostenibbiltà fil-ġestjoni alternattiva jew sperimentali u r-riċiklaġġ tal-iskart solidu urban tal-lokal.</li> <li>- <b>Homework:</b> L-istudenti se jkunu mistiedna sabiex jigbru l-istudji fuq il-każ, il-problemi, s-soluzzjonijiet ewlenin implimentati u l-limiti u jiktbu il-konkluzjoni tagħhom jew isemmu korsijiet possibbli oħra ta' azzjoni.</li> </ul>
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**METODI TA' PARTECIPAZZONI FIL-GESTJONI  
SOSTENIBBLI TAR-RIZORSI NATURALI  
PARTICIPATING METHODS IN SUSTAINABLE  
MANAGEMENT OF NATURAL RESOURCES  
MODULU / MODULE 1**



## Organizzazzjonijiet Partecipanti: Participating Organizations:

**UNIVERSITY OF NAPLES  
(UNINA)** <http://www.unina.it/home>

- Emilio Balzano, Aggregate Professor
- Caterina Miele, Post-Doctoral Fellow
- Marko Serpico, Research Associate

**UNIVERSITY OF IOANNINA  
(UOI)** <http://www.uoi.gr/en/>

- Katerina Plakitsi, Associate Professor
- Athina Christina Kornelaki, PhD student

The teaching language at the University of Malta is English and therefore the course content is being presented in the English language to be used by any Maltese students/learners.

Il-lingwa tat-tagħlim fl-Università ta' Malta hija l-Ingliż u għalhekk il-kontenut tal-kors qed jiġi ppreżentat bil-lingwa Ingliża għal-użu tal-istudenti Maltin.



# TABLE OF CONTENTS

- Action research
- Aspects of action research
- Participatory Approach
- Other Participatory methods and techniques
- Case study
- When to Use a Case Study Approach ?
- Three Steps in Designing Case Studies
- Data Sources
- Presenting Case Study Evidence
- Case study analysis
- Case Study Typologies
- Conclusion
- References



# ACTION RESEARCH

## What is it?

It is a form of research which can be undertaken by people in any context, regardless of their status or position. It involves you thinking carefully about what you are doing, so it can also be called a kind of self-reflective practice. In action research researchers do research on themselves in company with other people, and those others are doing the same. No distinction is made between who is a researcher and who is a practitioner. Practitioners are potential researchers, and researchers are practitioners. (McNiff J., Whitehead J., 2002)

## ASPECTS OF ACTION RESEARCH

- ❖ **Ontology** → How we view ourselves
- ❖ **Epistemology** → How we come to know
- ❖ **Methodology** → How we do things
- ❖ **Socio-political intent** → What we hope to achieve

# PARTICIPATORY APPROACH

## What is it?

- Advocates actively involving ‘the public’ in decision-making processes
- The relevant ‘public’ depends upon the topic being addressed
- The public can be average citizens, the stakeholders of a particular project or policy, experts and even members of government and private industry.
- Policy processes can be seen as a three-step cycle of
  - planning,
  - implementation and
  - evaluation,

A participatory approach may be used in some or all of these steps.

(Stocum N., 2003)



# PARTICIPATORY APPROACH

## When is it appropriate?

A participatory approach is particularly appropriate for addressing:

- Themes that require ethical, social or cultural study and may call for a choice between fundamental values and principles.
- Policy issues that call for a combination of public awareness, learning, a search for solutions and emotional or moral acceptance of the eventual decision.
- Public policy choices that will rely on the precautionary principle or the weight of evidence.
- Underlying values and principles that must be clarified before detailed proposals or risk management options are brought forward.
- A clearly defined set of options or proposals that support the search for consensus or innovative solutions

## OTHER PARTICIPATORY METHODS AND TECHNIQUES

- **Charrette**
- **Citizens Jury**
- **Consensus Conference**
- **Delphi**
- **Expert Panel**
- **Focus group**
- **Participatory Assessment, Monitoring and Evaluation**
- **Planning cell**
- **Scenarios**
- **The World Cafe**

# CHARRETTE

## DEFINITION:

- An intensive face-to-face process designed to bring people from various sub-groups of society into consensus within a short period of time.
- The pre-Charrette planning breaks the main issue into component parts, to which sub-groups of people are assigned.
- The subgroups periodically report back to the whole group and feedback from the whole is then addressed in the next round of sub-group discussions. This sequence is repeated until consensus is reached at the final deadline for a report.
- Charrettes vary in size, from 50 to over 1,000 people, and in time, from four days to two weeks.

# CHARRETTE

## WHEN TO USE:

In general, a Charrette will:

- ✓ assemble practical ideas and viewpoints at the beginning of a planning process
- ✓ encourage input and collaboration from a wide range of participants
- ✓ facilitate decisions on difficult issues when a process is mature
- ✓ resolve indecision or deadlocks between groups toward the end of a process
- ✓ develop feasible projects and action plans with specific practical steps for the successful development
- ✓ of projects based upon citizen input
- ✓ identify potential funding sources for projects.

# CITIZENS JURY

## DEFINITION:

- A means for obtaining informed citizen input into policy decisions.
- The jury is composed of 12-24 randomly selected citizens, who are informed by several perspectives, often by experts referred to as ‘witnesses’.
- The jurors then go through a process of deliberation and subgroups are often formed to focus on different aspects of the issue.
- Finally, the jurors produce a decision or provide recommendations in the form of a citizens’ report. The sponsoring body (e.g. government department, local authority) is required to respond to the report either by acting on it or by explaining why it disagrees with it.
- Usually a 4-5 day process, the Citizens Jury is intended to provide a means for more democratic decision-making.



# CITIZENS JURY

## WHEN TO USE:

- A wide range of topics, including economic, environmental, social and political issues.
- Most applicable when one or more alternatives to a problem need to be selected and the various competing interests arbitrated.
- Sponsors are usually government agencies, but can also be NGOs or anyone interested in providing a context in which competing alternatives can be expressed and arbitrated. However, the sponsor(s) should be seen as unbiased toward a particular outcome.
- The method is most likely to lead to concrete action when it is directly linked to legislation or other decision-making process.

# CONSENSUS CONFERENCE

## DEFINITION:

- A public enquiry centered around a group of 10 to 30 citizens who are charged with the assessment of a socially controversial topic.
- These laypeople put their questions and concerns to a panel of experts, assess the experts' answers and then negotiate among themselves.
- The result is a consensus statement that is made public in the form of a written report directed at parliamentarians, policy makers and the general public that expresses their expectations, concerns and recommendations at the end of the conference.
- The goal is to broaden the debate on a given issue and include the viewpoints of non-experts in order to inform policy-making.

# CONSENSUS CONFERENCE

- This method is most useful for combining many forms of knowledge (e.g. local, traditional, technical).
- It is a useful method for obtaining informed opinions from laypersons.
- It can also allow for the inclusion of subjective knowledge in scientific, technological and other technical developments.
- More generally, it is a viable alternative to use when all or most of the following criteria are present:
  - Citizen input is required for policies under review or development.
  - Issues are controversial, complex and/or technical.
  - Many diverse groups and individuals have concerns.
  - Ensuing decisions significantly and directly affect select groups or individuals.
  - There is a need for increased public awareness and debate.
  - There is citizen desire for a more formal involvement.

# DELPHI

## DEFINITION:

- Involves an iterative survey of experts.
- Each participant completes a questionnaire and is then given feedback on the whole set of responses.
- (S)He then fills in the questionnaire again, this time providing explanations for any views they hold that were significantly divergent from the viewpoints of the others participants.
- The explanations serve as useful intelligence for others. In addition, (s)he may change his/her opinion, based upon his/her evaluation of new information provided by other participants.
- This process is repeated as many times as is useful.
- In most Delphi processes the mount of consensus increases from round to round.

# DELPHI

- Traditionally conducted via mail,
- Other variations of Delphi can be conducted online or face-to-face.
- Original Delphi process, the key characteristics of this method were (1) structuring of information flow, (2) feedback to the participants and (3) anonymity for the participants.
- In a face-to-face Delphi, the anonymity is eliminated.
- Another variation of the Delphi is the 'Policy Delphi', the main goal of which is to expose all the different options and opinions regarding an issue and the principal pro and con arguments for these positions.

# DELPHI

## WHEN TO USE:

Usually one or more of the following properties of the application leads to the need or usefulness of employing Delphi:

- The problem does not lend itself to precise analytical techniques but can benefit from subjective judgments on a collective basis.
- The individuals needed to contribute to the examination of a broad or complex problem have no history of adequate communication and may represent diverse backgrounds with respect to experience or expertise.
- More individuals are needed than can effectively interact in a face-to-face exchange (except through the face-to-face Delphi's shuttle process between plenary and sub-groups).

# DELPHI

- Time and cost make frequent group meetings infeasible.
- The efficiency of face-to-face meetings can be increased by a supplemental group communication process.
- Disagreements among individuals are so severe or politically unpalatable that the communication process must be refereed and/or anonymity assured.
- Heterogeneity of the participants must be preserved to assure validity of the results, i.e. avoidance of domination by quantity or by strength of personality.

# EXPERT PANEL

## DEFINITION:

- The main task is usually synthesising a variety of inputs – testimony, research reports, outputs of forecasting methods, etc. – and produce a report that provides a vision and/or recommendations for future possibilities and needs for the topics under analysis.
- Specific tools may be employed to select and motivate the panel, assign tasks and elicit sharing and further development of knowledge.



# EXPERT PANEL

## WHEN TO USE:

- Expert panels are particularly appropriate for issues that require highly technical knowledge and/or are highly complex and require the synthesis of experts from many different disciplines.
- This method is not designed to actively involve the broad public.

# FOCUS GROUP

## DEFINITION:

- A planned discussion among a small group (4-12 persons) of stakeholders facilitated by a skilled moderator.
- It is designed to obtain information about (various) people's preferences and values pertaining to a defined topic and why these are held by observing the structured discussion of an interactive group in a permissive, non-threatening environment.
- A focus group can be seen as a combination between a focused interview and a discussion group.
- Focus groups can also be conducted online.

# FOCUS GROUP

## WHEN TO USE:

Focus groups are useful to:

- gauge the nature and intensity of stakeholders' concerns and values about the issues
- obtain a snapshot of public opinion when time constraints or finances do not allow a full review or survey
- obtain input from individuals as well as interest groups
- obtain detailed reaction and input from a stakeholder or client group to preliminary proposals or options
- collect information on the needs of stakeholders surrounding a particular issue or concept
- determine what additional information or modification may be needed to develop consultation issues or proposals further.

# PARTICIPATORY ASSESSMENT, MONITORING AND EVALUATION

## DEFINITION:

A Participatory Evaluation is an opportunity for the stakeholders of a project to stop and reflect on the past in order to make decisions about the future. Through the evaluation process participants share the control and responsibility for:

- ❖ deciding what is to be evaluated
- ❖ selecting the methods and data sources
- ❖ carrying out the evaluation and
- ❖ analysing information and presenting evaluation results.

# PARTICIPATORY ASSESSMENT, MONITORING AND EVALUATION

## WHEN TO USE:

Participatory Evaluation may be conducted for the following reasons:

➤ **Because it has been planned(!)**

Participatory Evaluation can be planned at various points throughout a project. These can be mid-way through a series of activities or after each activity, depending on when the community decides it needs to stop and examine past performance.

➤ **Because a (potential) crisis is looming**

Participatory Evaluation can help to avoid a potential crisis by bringing people together to discuss and mediate a solution to important issues.

# PARTICIPATORY ASSESSMENT, MONITORING AND EVALUATION

## ➤ Because a problem has become apparent

Problems, such as a general lack of community interest in activities, may be apparent. Participatory Evaluation may provide more information that can help people determine why there is a problem and how to remedy it.

## ➤ To introduce and establish a participatory approach.

A Participatory Evaluation may shed some understanding on why a project is not working very well. The results of a Participatory Evaluation may be the entry point for a more participatory approach to the project in general.

# PLANNING CELL

## DEFINITION:

- Engages approximately twenty-five randomly selected people, who work as public consultants for a limited period of time (e.g. one week), in order to present solutions for a given planning or policy problem.
- The cell is accompanied by two process-escorts, who are responsible for the information schedule and the moderation of the plenary sessions.
- A project may involve a larger or smaller number of planning cells.
- In each cell participants acquire and exchange information about the problem, explore and discuss possible solutions and evaluate these in terms of desirable and undesirable consequences.
- Experts, stakeholders and interest groups have the opportunity to present their positions to the cell members.

The final results of the cells' work are summarised as a 'citizen report', which is delivered to the authorities as well as to the participants themselves.

# PLANNING CELL

## WHEN TO USE:

The following criteria should be used to evaluate the suitability of the Planning Cells procedure for a given application. When all or most are answered positively, the Planning Cell method will be suitable.

- Variability of options: Do the participants have the choice of selecting one option out of a variety of options that are all feasible in the specific situation?
- Equity of exposure: Are all groups of the community or the respective constituency exposed in some way to the potential disadvantages of the proposed options (to avoid a distinction between affected abutters and indifferent other citizens)?



# PLANNING CELL

- Personal experience: Do participants have some experiences with the problem and do they feel competent about giving recommendations after they are further educated about the problem and the remedial options?
- Personal relevance: Do participants judge the problem as serious enough to sacrifice several days of their time to work on solutions?
- Seriousness and openness of sponsor: Is the sponsor willing to accept, or at least carefully consider, the recommendations of the Planning Cell(s) or do they pursue hidden agendas?

# SCENARIOS WORKSHOPS

## DEFINITION:

Scenarios are narrative descriptions of potential futures that focus attention on relationships between events and decision points.

# SCENARIOS WORKSHOPS

## WHEN TO USE:

As a rule, scenario construction is particularly useful in situations where the past or present is unlikely to be a guide for the future, in particular where:

- ☐ the problem is complex
- ☐ there is a high probability of significant change
- ☐ the dominant trends may not be favourable and thus must be analyzed
- ☐ the time-horizon is relatively long.

# SCENARIOS WORKSHOPS

Thus the main applications of scenario workshops are to:

- improve long-term decision-making
- motivate change
- generate alternative trajectories for future developments
- improve preparedness for emergencies and contingencies
- guide key choices
- build future-oriented knowledge and action networks
- generate a vision and action-plan for realization.

# THE WORLD CAFE

## DEFINITION:

- A creative process for facilitating collaborative dialogue and the sharing of knowledge and ideas to create a living network of conversation and action.
- In this process a cafe ambiance is created, in which participants discuss a question or issue in small groups around the cafe tables.
- At regular intervals the participants move to a new table.
- One table host remains and summarizes the previous conversation to the new table guests.
- The proceeding conversations are cross-fertilised with the ideas generated in former conversations with other participants.
- At the end of the process the main ideas are summarized in a plenary session and follow-up possibilities are discussed.

# THE WORLD CAFE

## WHEN TO USE:

The World Café process is particularly useful in the following situations:

- To engage large groups (larger than 12 persons) in an authentic dialogue process (Groups of 1200 have been conducted!).
- When you want to generate input, share knowledge, stimulate innovative thinking and explore action possibilities around real life issues and questions.
- To engage people in authentic conversation – whether they are meeting for the first time or have established relationships with each other.
- To conduct in-depth exploration of key strategic challenges or opportunities.
- To deepen relationships and mutual ownership of outcomes in an existing group.
- To create meaningful interaction between a speaker and the audience.

# CASE STUDY

## WHAT IS IT?

A case study is expected to capture the complexity of a single case, and the methodology which enables this has developed within the social sciences. Such methodology is applied not only in the social sciences, such as psychology, sociology, anthropology, and economics, but also in practice-oriented fields such as environmental studies, social work, education, and business studies.

The case study should have a “case” which is the object of study. The “case” should:

- be a complex functioning unit,
- be investigated in its natural context with a multitude of methods, and
- be contemporary.

# WHEN TO USE A CASE STUDY APPROACH ?

According to Yin (2003) a case study design should be considered when:

- a) the focus of the study is to answer “how” and “why” questions
- b) you cannot manipulate the behavior of those involved in the study
- c) you want to cover contextual conditions because you believe they are relevant to the phenomenon under study or
- d) the boundaries are not clear between the phenomenon and context.



# THREE STEPS IN DESIGNING CASE STUDIES:

1. Defining a “Case”
2. Selecting One of Four Types of Case Study Designs
3. Using Theory in Design Work

# 1. DEFINING A CASE

- Arriving at even a tentative definition helps enormously in organizing your case study.
- A “case” is generally a bounded entity (a person, organization, behavioral condition, event, or other social phenomenon), but the boundary between the case and its contextual conditions—in both spatial and temporal dimensions—may be blurred
- The case serves as the main unit of analysis in a case study. At the same time, case studies also can have nested units within the main unit

## 2. SELECTING ONE OF FOUR TYPES OF CASE STUDY DESIGNS

Decide whether your case study will consist of a single or multiple cases—what then might be labeled as a single- or a multiple-case study.

Whether single or multiple, you also can choose to keep your case holistic or to have embedded subcases within an overall holistic case. The resulting two-by-two matrix leads to four different case study designs.

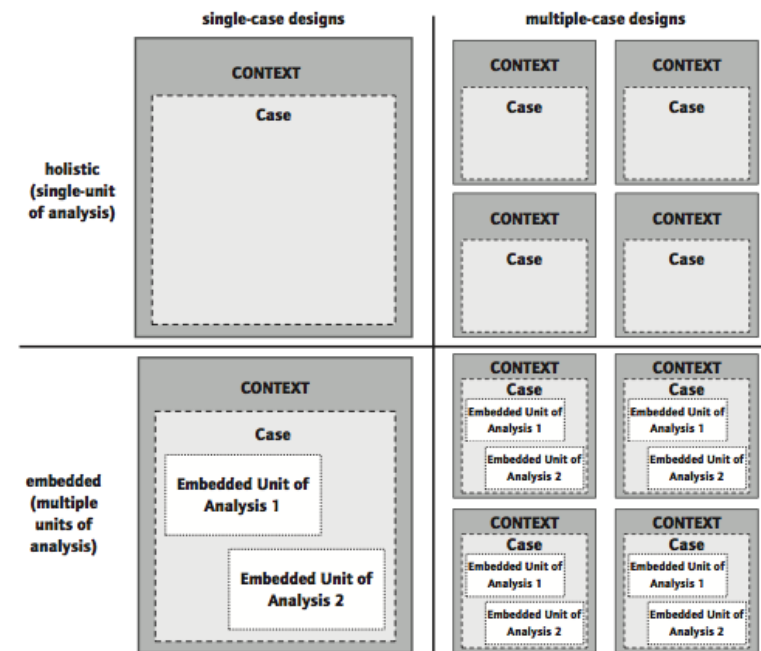


Figure 2.4 Basic Types of Designs for Case Studies  
SOURCE: COSMOS Corporation.

### 3. USING THEORY IN DESIGN WORK

- Decide whether or not to use theory to help complete your essential methodological steps, such as developing your research question(s), selecting your case(s), refining your case study design, or defining the relevant data to be collected.
- The use of theory also can help organize your initial data analysis strategies and generalize the findings from your case study.

# DATA SOURCES

A hallmark of case study research is the use of multiple data sources, a strategy which also enhances data credibility (Patton, 1990; Yin, 2003).

You may use these six in any combination, as well as related sources such as focus groups (a variant of interviews), depending on what is available and relevant for studying your case(s).

1. Direct observations (e.g., human actions or a physical environment).
2. Interviews (e.g., open-ended conversations with key participants).
3. Archival records (e.g., student records).
4. Documents (e.g., newspaper articles, letters and e-mails, reports).
5. Participant-observation (e.g., being identified as a researcher but also filling a real-life role in the scene being studied).
6. Physical artifacts (e.g., computer downloads of employees' work).

## PRESENTING CASE STUDY EVIDENCE

- Present the evidence in your case study with sufficient clarity (e.g., in separate texts, tables, and exhibits) to allow readers to judge independently your later interpretation of the data.
- Ideally, such evidence will come from a formal case study database that you compile for your files after completing your data collection.

# CASE STUDY ANALYSIS

- 1) **Pattern-matching** logic would later enable you to compare your empirically based pattern (based on the data you had collected) with the predicted one.
- 2) A case study may not have started with any predicted patterns but in fact may have started with an open-ended research question that would lead to the use of an **explanation-building** technique.
- 3) A third technique mimics the ***time-series analyses*** in quantitative research. In case study research, the simplest time series can consist of assembling key events into a *chronology*.

# CASE STUDY TYPOLOGIES

Business School Case Studies	Best Practice Case Studies
<b>Field Case Study:</b> Gathering of original research. Usually involves direct observation and interviews.	<b>Implementation Case Study:</b> Focuses on the change management aspects of putting a practice into effect within the workplace. Focus is on major stages of the process, not necessarily the long-term outcome.
<b>Literature Case Study:</b> Developed by looking exclusively at already existing/published materials.	<b>Success Case Study:</b> Looks at those practices that have proven successful in terms of outcomes. Suggests methodologies where similar practices can be used in other areas of Public Administration.
<b>Armchair Case Study:</b> Explains a management idea by presenting a hypothetical scenario.	<b>Failure Case Study:</b> Looks at situation where things went wrong with the intention of identifying lessons learned.



# CONCLUSION

Field Case, Implementation Case and Success Case methodologies seem most plausible for training purposes for the following reasons:

- **Challenge:** these approaches generally tend to highlight why an event is worth discussing
- **Context:** highlight salient points about the context and circumstances affecting an issue at hand.
- **Strategy:** highlight approaches adopted to address identified challenges
- **Outcome:** show results achieved and lessons learnt and finally
- **Discussion Points:** facilitate discussions through issues and questions readers may identify.

# CONCLUSION

**Field Case Studies**

**Implementation  
Case Studies**

**Success  
Case Studies**

## **The Challenge:**

Why is this event worth discussing

## **The Context:**

Salient points about the environment and the circumstances affecting the issue at hand.

## **The Strategy:**

The approach adopted to address the challenges.

## **The Outcome:**

The results achieved and the lessons learned.

## **Discussion Points:**

Questions or issues that readers of the case may want to consider and discuss.

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# THANKS FOR YOUR ATTENTION!





**Metodi ta'  
partecipazzjoni fil-  
gestjoni sostenibbli  
tar-rizorsi naturali**

**Participating  
methods in  
sustainable  
management of  
natural resources**

**Modulu / Module 2**

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## Organizzazzjonijiet Partecipanti: Participating Organizations:

**University of Naples (UNINA)**

<http://www.unina.it/home>

- **Emilio Balzano, Aggregate Professor**
- **Caterina Miele, Post-Doctoral Fellow**
- **Marko Serpico, Research Associate**

**University of Ioannina (UOI)**

<http://www.uoi.gr/en/>

- **Katerina Plakitsi, Associate Professor**
- **Athina - Christina Kornelaki, PhD student**

The teaching language at the University of Malta is English and therefore the course content is being presented in the English language to be used by any Maltese students/learners.

Il-lingwa tat-tagħlim fl-Università ta' Malta hija l-Ingliż u għalhekk il-kontenut tal-kors qed jiġi ppreżentat bil-lingwa Ingliża għal-użu tal-istudenti Maltin.

# TABLE OF CONTENTS

- Sustainability
- Holistic Approach to Sustainability
- Principles of Sustainable Development
- Key issues in connection with future global efforts to promote sustainable development
- Internal and global efforts by the EU to achieve sustainable development
- The Ethical Substrate of Sustainability as a Holistic Vision
- Socio-Cultural Constructivism Perspective
- Societal Context: from an (inter) disciplinary to a transdisciplinary approach
- Transdisciplinary Case Studies
- References

# SUSTAINABILITY

## Definition:

- ❖ Sustainability is derived from the Latin *sustinere* (*tenere*, to hold; *sus*, up).
- ❖ Dictionaries provide more than ten meanings for sustain, the main ones being to maintain, support, or endure.
- ❖ Since the 1980s , sustainability has been used more in the sense of human sustainability on planet Earth.



# SUSTAINABILITY

**This has resulted in the most widely quoted definition of sustainability:**

**“sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”**

Source: World Commission on Environment and Development (established by a resolution of UN General Assembly) (Brundtland Commission, 1987).

# SUSTAINABILITY

## Benefits of sustainability:

- ❖ Improved energy efficiency
- ❖ Improved overall performance
- ❖ Reduced total cost of ownership

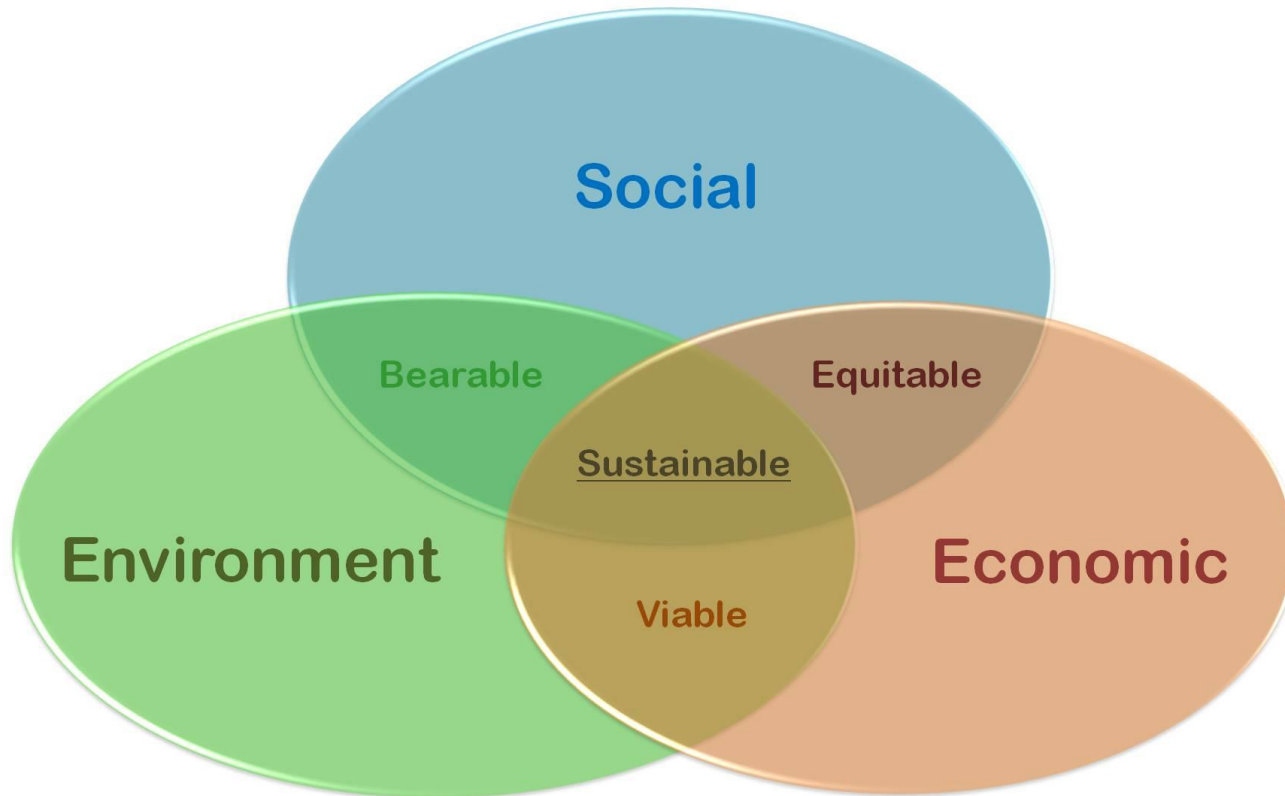
# HOLISTIC APPROACH TO SUSTAINABILITY

- Sustainability is a complex and multifaceted vision of development.
- It is a multidimensional model of development which limits economic growth and other human activities to the capacity of nature for self-regeneration, places the improvement of the human condition (social and human development) as its primary goal, and places respect for environmental quality and the limits of nature at the core of any economic, political, educational and cultural strategy.

# HOLISTIC APPROACH TO SUSTAINABILITY

- Sustainable development is often presented as being divided into the economy, environment and society (Hardi and Zdan, 1997; West Midlands Round Table, 2000).
- Three sectors are often presented as three interconnected rings (ICLEI, 1996; du Plessis, 2000; Barton, 2000) The model has a conceptual simplicity.
- By encouraging the classification of impacts into three convenient categories it makes analysis more straightforward.

# HOLISTIC APPROACH TO SUSTAINABILITY



# HOLISTIC APPROACH TO SUSTAINABILITY

1. **POLITICAL REALITY:** Prioritizing the economy
2. **MATERIAL REALITY:** Nesting economy in society and environment
3. **MULTI-LAYERED AND MULTI-FACETED**
4. **CHANGE OF VIEWPOINT:** Breaking down the boundaries

# 1. POLITICAL REALITY

- ❖ **Political reality gives primacy to the economy. This largely treats the environment and society as a resource to be exploited, both natural and human, and as a sink where problems are dumped, whether unemployment, ill health or waste.**
- ❖ **Normally when governments, businesses and some theoreticians talk about the economy, they mean the production and exchange of goods and services through the operation of the market. They are referring to the capitalist economy.**



## 2. MATERIAL REALITY

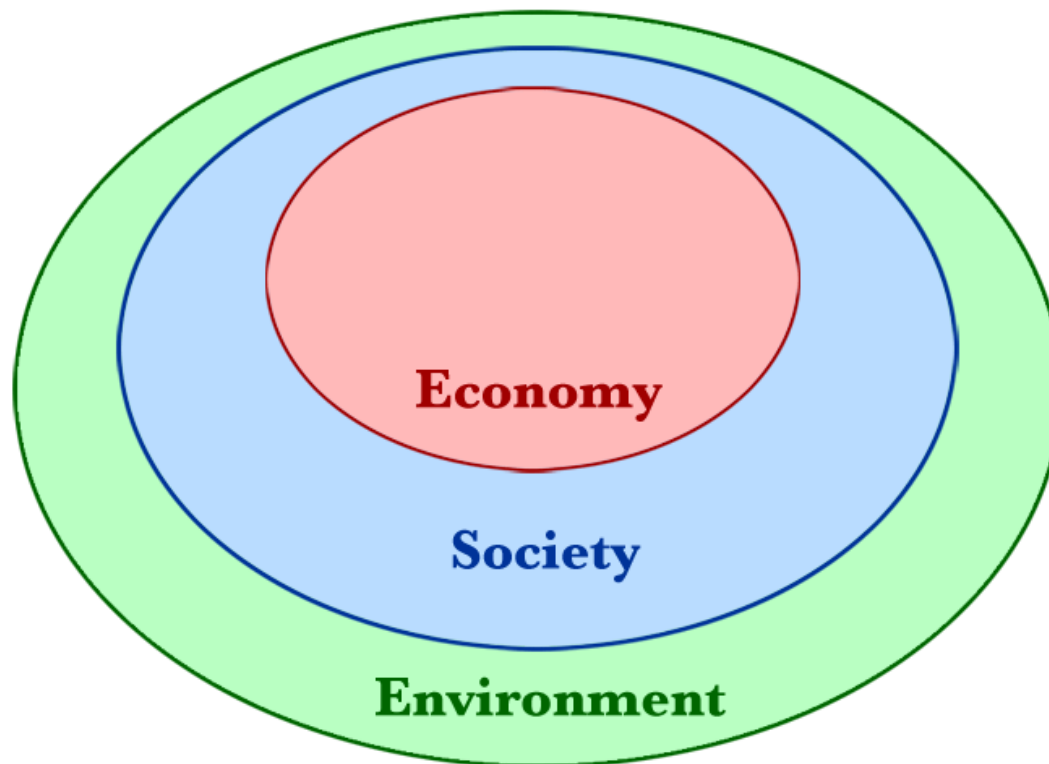
- ❖ The material reality is that the economy is dependent on society and the environment (Daly, 1992; Rees, 1995; Wackernagel and Rees, 1996).
- ❖ Human activity takes place within the environment. Nearly all our actions have an impact on the environment. Human life itself depends on the environment. Our material needs, heat, light, food, medicines, clothing, as well as modern consumer goods are made with materials and energy that come from it.



## 2. MATERIAL REALITY

- ❖ It is an abstraction to conceive of the economy as a separate area of activity. Without society there can be no economy.
- ❖ A more accurate presentation of the relationship between society, economy and environment than the usual three rings is of the economy nested within society, which in turn is nested within the environment.
- ❖ A key issue for sustainable development is the integration of different actions and sectors, taking a holistic view and overcoming barriers between disciplines. The 'nested' model rather than the 'three-ring' model encourages a conceptual outlook sympathetic to integration.

# NESTED SUSTAINABLE DEVELOPMENT



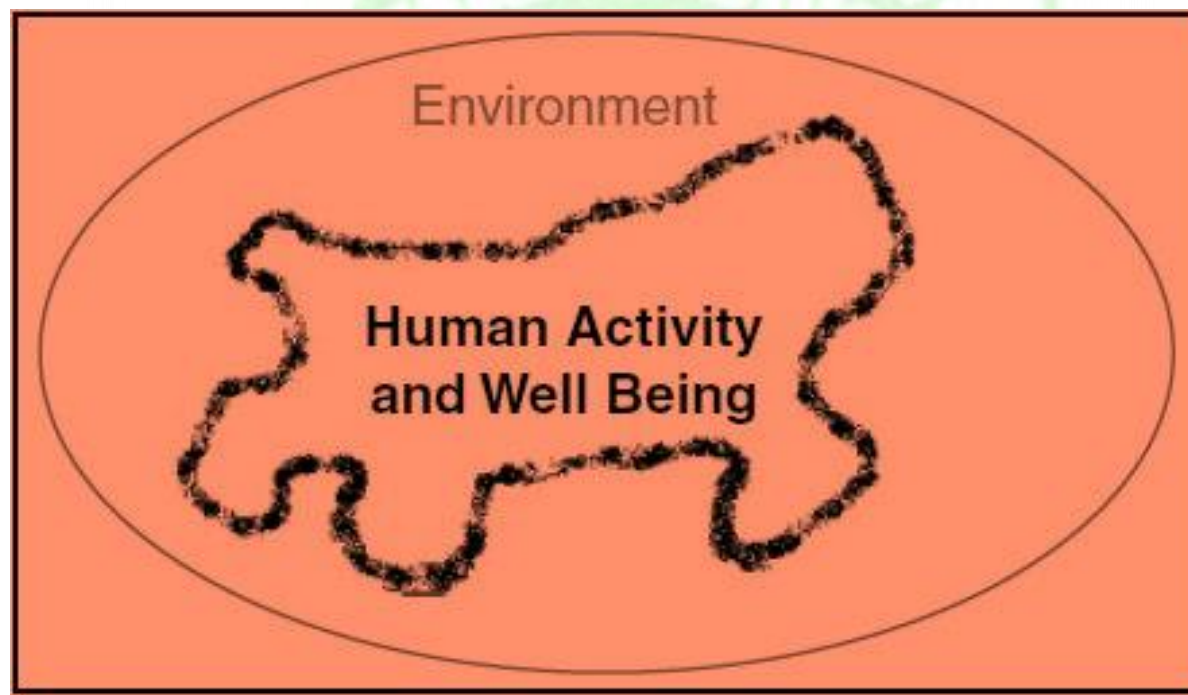
### 3. MULTI-LAYERED & MULTI-FACETED

- ❖ There are a multitude of environments, societies and economies. At different spatial scales different environments, economies or societies are apparent.
- ❖ There is a complex connection and interaction between the local and the global.
- ❖ The effect of pretending that the economy and society are each a unified whole is to ignore diversity and difference and instead give precedence to the dominant parts.
- ❖ Just as in the environment, diversity is an important part of human sustainability (Jacobs, 1965). The changes in science, technology, art and culture are stimulated by diversity.

## 4. CHANGE OF VIEWPOINT

- ❖ Humanity's well being depends on the environment, although we should recognize that the natural world, although it would change without humans, would survive without us. The same cannot be said for humanity. The boundary between the environment and human activity is itself not neat and sharp; rather it is fuzzy.
- ❖ There is a constant flow of materials and energy between human activities and the environment and both constantly interact with each other.

**Human activities and the environment constantly interact with each other.**



## 4. CHANGE OF VIEWPOINT

- ❖ Defining the aim as human well being would encourage seeing discrimination in any form as contrary to sustainable development, rather than as at present, as undesirable but justified by gains elsewhere.
- ❖ Instead of having a priority on the economy, which is a means to an end, the focus should be on human provisioning and satisfying needs, which may be done in many more ways than those described within economy.



# PRINCIPLES OF SUSTAINABLE DEVELOPMENT

Sustainable development needs to be based on principles that would apply to all issues whether they are classified as environmental, social, economic or any mix of the three. Haughton (1999) outlines five equity principles:

- a. **Futurity–inter-generational equity**
- b. **Social justice–intra-generational equity**
- c. **Transfrontier responsibility–geographical equity**
- d. **Procedural equity–people treated openly and fairly–and**
- e. **Inter-species equity–importance of biodiversity.**



## **The Principles of Sustainable Development**

As sustainable development principles for human relations these can be summarized as futurity to give regard for the needs of future generations; equity covering social justice regardless of class, gender, race, etc. or where they live and participation so that people are able to shape their own futures. A principle recognizing the importance of biodiversity and ecosystem integrity is also vital.



# Key issues in connection with future global efforts to promote sustainable development:

- ❖ Equitable, sustainable global development
- ❖ The tasks of the Armed Forces
- ❖ Trade for sustainable development
- ❖ Combating poverty
- ❖ The fight against HIV / AIDS
- ❖ Sustainable consumption and production patterns
- ❖ Water and sanitation
- ❖ Housing and sustainable building
- ❖ Energy

## **Internal and global efforts by the EU to achieve sustainable development:**

- ❖ **Combating climate change.**
- ❖ **The need for sustainable transport.**
- ❖ **Threats to public health, including communicable diseases and the use of chemicals.**
- ❖ **More responsible management of natural resources.**



# THE ETHICAL SUBSTRATE OF SUSTAINABILITY AS A HOLISTIC VISION

- The idea of sustainable development as a holistic vision implies fundamental changes at all levels of social, economic, political, and cultural structures, which means a fundamental restructuring of present society.
- Sustainable development is that development which allows us to meet the needs and aspirations of both present and future generations always in a concrete social-historic and environmental context without undermining the capacity of nature and cultures for self-regeneration, while giving special attention to the eradication of poverty, social injustice, and inequalities in the relations among nations.

# THE ETHICAL SUBSTRATE OF SUSTAINABILITY AS A HOLISTIC VISION

- ❖ Responsibility has become the fundamental ethical imperative in modern civilization, and it should be an unavoidable criterion to assess and evaluate human actions, including, in a special way, development activities. Human beings have the responsibility and the moral obligation not only to preserve their present and future existence but also the existence of all living species on the planet.
- ❖ The new ethical values for a holistic conception of sustainability must now be respect for the integrity of the environment and all its life forms and vital support systems; respect for the planet's cultural diversity and human dignity and integrity; and equality and solidarity between persons, people and continents.

# **SOCIO-CULTURAL CONSTRUCTIVISM PERSPECTIVE**

Global changes in economy, society, and culture affect how science and, therefore, also how university education is understood. These changes can be characterized by increased complexity, connectedness, and speed of transformations in the research objects. In a rough overview, some of the major developments are as follows:

- ❖ **Concept of sustainability**
- ❖ **Increasing complexity**
- ❖ **Globalization**
- ❖ **Governance**
- ❖ **Reflexive modernization**



# SOCIO-CULTURAL CONSTRUCTIVISM PERSPECTIVE

Challenges occur mainly in three domains:

- ❖ the subject domain,
- ❖ the domain of the societal context, and
- ❖ the process domain

## **SUBJECT AERIA: learning to research complex problems**

- ❑ Environmental problems represent real phenomena, which bring about issues such as uncertainty, complexity, and incompleteness of information, but also context and personal experience.
- ❑ This also implies an active approach on the part of the student, who utilizes his or her own knowledge base directly, learning how to handle and reduce complexity in an interactive process.
- ❑ From a didactical perspective, the real-world problem provides the starting point, framing, and stimuli for active learning, whereas the teacher takes the role of a facilitator.

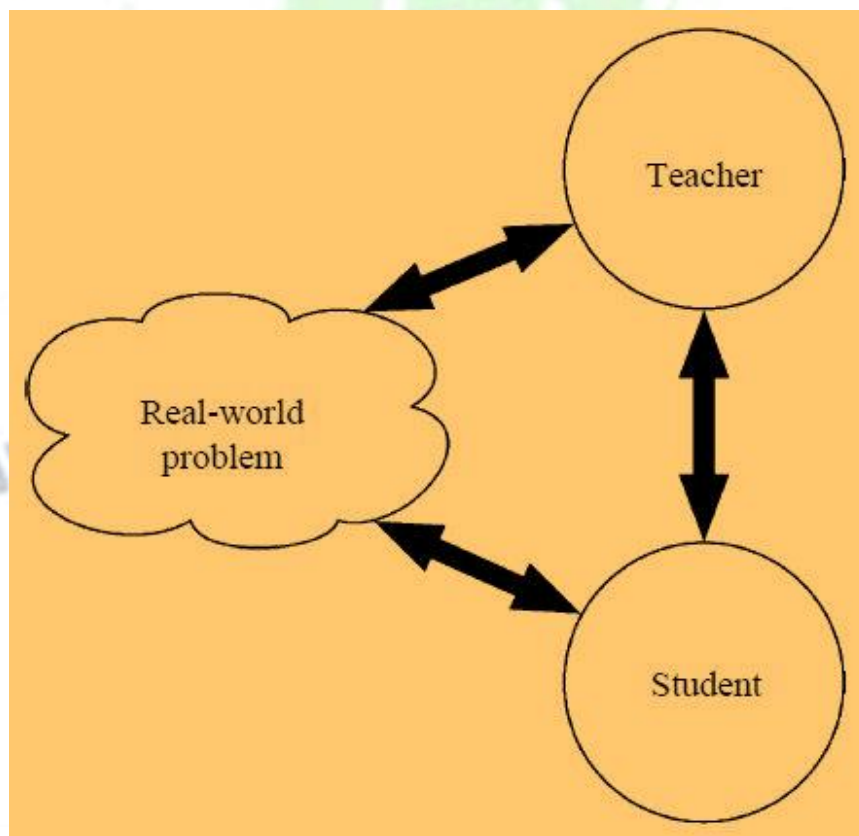


# PROCESS:

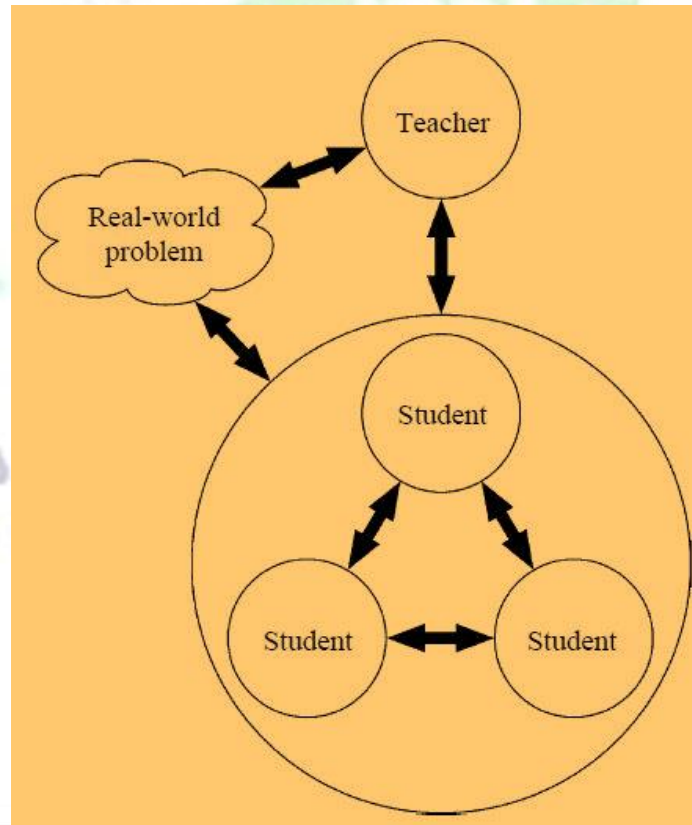
## learning in teams

- ❑ The interaction and communication process between teachers and students becomes increasingly important; but more crucially, real-world complex problems require an interdisciplinary approach to problem solving, which demands teamwork among a group of researchers.
- ❑ An active student role is necessary: They have to be self-organized, actively dividing the problem into sub-tasks and thereby deciding what they can and want to learn. The teaching paradigm changes from “learning by listening” to “learning by doing”.
- ❑ The teacher’s role changes from a distributor of knowledge to a process manager, helping the students in their learning process by initiating reflection processes and supporting them, if necessary, on substantive matters

# Student and teachers address real-world problems.



**The educational approach, therefore, has to integrate teamwork aspects and integrate students into a project team.**



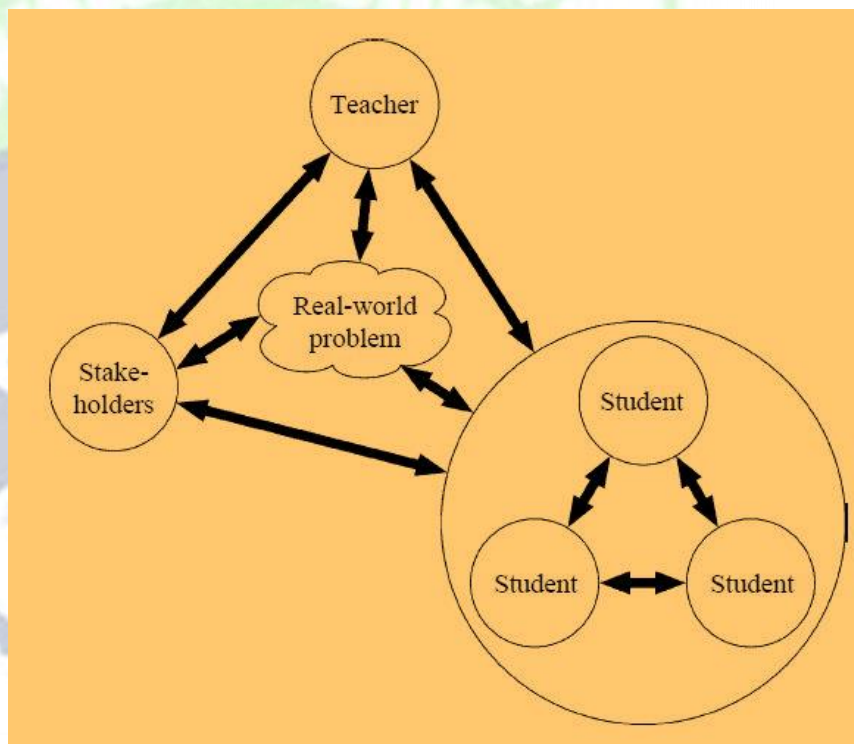
**Students work in groups to solve problems.**

## **SOCIETAL CONTEXT: from an (inter)disciplinary to a transdisciplinary approach**

**Complex real-world problems necessitate that actors or stakeholders from outside the university are integrated into the problem-solving process because they have concrete system knowledge and their preferences are crucial in the implementation process. As they do not all follow the same rationality, their interests and goals influence the perception of the problem.**

**Reality” as such, is replaced by a constructivist view. Different views of reality need to be negotiated and integrated.**

**In this transdisciplinary approach, the teacher, student, and stakeholders can form a community in which specific learning processes take place.**



**Stakeholders are involved in the problem-solving process.**

# TRANSDISCIPLINARY CASE STUDIES

This can be illustrated for all three domains introduced above:

1. **Subject area domain.** Complex and multi-faceted real-world problems are ill-defined, where neither the initial nor the target state is sufficiently known (Scholz et al., 1997a, b).
2. **Process domain.** Working in groups of 10-15 students, intense communication with stakeholders, and multi-criteria assessments with stakeholders are central principles of the TCS. Knowledge of group processes becomes important, as well as general management skills (Stauffacher, 2001).



# TRANSDISCIPLINARY CASE STUDIES

**3. Societal context domain.** In contrast to interdisciplinary research, our study goes beyond science through transdisciplinary research (Gibbons and Nowotny, 2001; Scholz et al., 2000; Scholz, 2000; Scholz and Marks, 2001; Scholz and Stauffacher, 2001). coordinating a transdisciplinary research project is the core competence taught in this domain.

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# Thank you for your attention!



The global challenges  
of tomorrow drive our work  
today. We shape sustainable  
development worldwide.

# **Metodi ta' parteċipazzjoni fil-ġestjoni sostenibbli tar-riżorsi naturali**

## **Participating methods in sustainable management of natural resources**



**Modulul/ Module 3**

# Participating methods in sustainable management of natural resources

## Module 3

### Organizzazzjonijiet Parteċipanti: / Participating Organizations:

**University of Naples (UNINA)**

<http://www.unina.it/home>

- **Emilio Balzano, Aggregate Professor**
- **Caterina Miele , Post-Doctoral Fellow**
- **Marko Serpico, Research Associate**

**University of Ioannina (UOI)**

<http://www.uoi.gr/en/>

- **Katerina Plakitsi, Associate Professor**
- **Athina Christina Kornelaki, PhD student**

The teaching language at the University of Malta is English and therefore the course content is being presented in the English language to be used by any Maltese students/learners.

Il-lingwa tat-tagħlim fl-Università ta' Malta hija l-Ingliż u għalhekk il-kontenut tal-kors qed jiġi pprezentat bil-lingwa Ingliża għal-użu tal-istudenti Maltin.

# Table of Contents

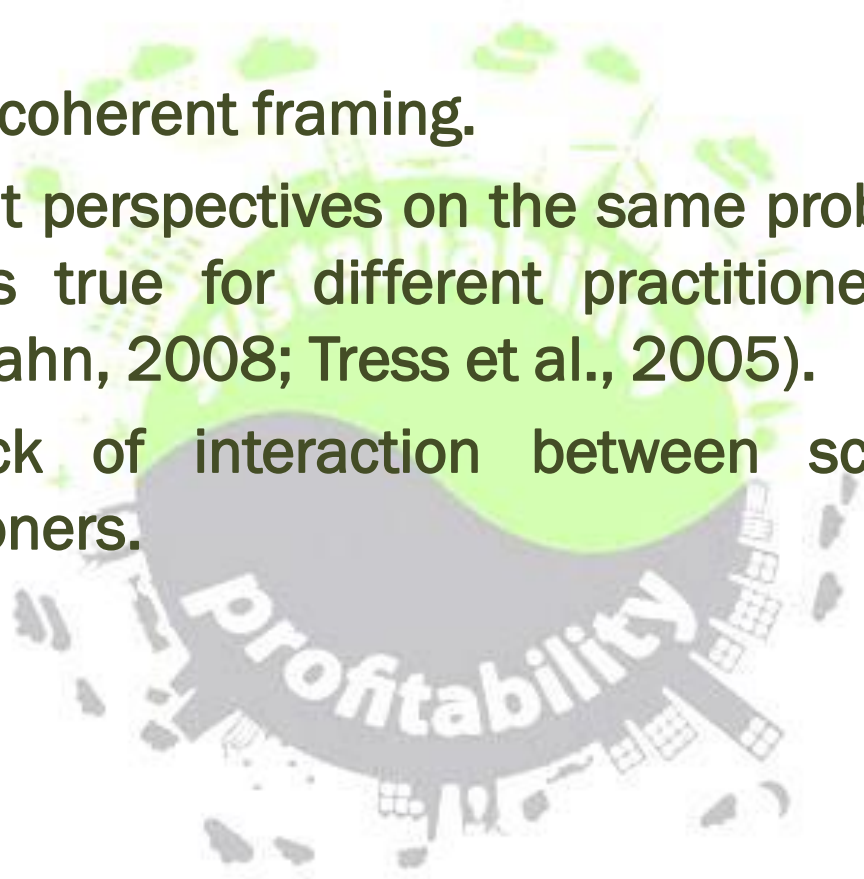
- ✎ Transdisciplinarity
- ✎ Transdisciplinary approach
- ✎ Complex systems
- ✎ What makes systems complex?
- ✎ Examples of Complex Systems
- ✎ Central properties of complex systems
- ✎ From elements and parts to complex systems
- ✎ Four questions related to the complex systems
- ✎ Summarizing the two approaches above
- ✎ Complex Systems and Some Attributes
- ✎ Crosscutting Concepts
- ✎ The case study of “Framework”
- ✎ Crosscutting Concepts in the “Framework”
- ✎ Guiding Principles

# Transdisciplinarity

- ∞ A research approach that includes multiple scientific disciplines (interdisciplinarity) focusing on shared problems and the active input of practitioners from outside academia. Yet the implementation is fraught with practical and institutional difficulties (Lang et al., 2012).
- ∞ We identify five key challenges to undertaking transdisciplinary approaches to sustainability science.

# Challenge 1

- ⌘ Lack of coherent framing.
- ⌘ Different perspectives on the same problem and the same is true for different practitioners (Gibbons, 1999; Jahn, 2008; Tress et al., 2005).
- ⌘ The lack of interaction between scientists and practitioners.



# Challenge 1

- ⌘ This lack of common research framing hampers scientific communication and knowledge exchange between scientific disciplines that do not share methodological or conceptual definitions (Tress et al., 2005; Winder, 2003).
- ⌘ Attempts to link scientists and practitioners in sustainability science aim to strengthen the exchange and integration of different disciplinary and non-academic knowledge, enabling mutual learning between scientists and practitioners (Lang et al., 2012; Scholz, 2011; Stahl et al., 2011).



# Challenge 2

- ∞ Integration of methods.
- ∞ Transdisciplinarity requires both the integration of different disciplinary methods (Bergmann, 2010) and the development of novel research methods to enable efficient and effective learning processes at the science-society interface (Bergmann and Schramm, 2008; Lawrence and Despres, 2004).



# Challenge 3

- ⌘ Research process and knowledge production.
- ⌘ The focus of sustainability science moves beyond system description, thus includes problem definition, analysis and generation and application of solutions to real world problems.
- ⌘ The implementation of transdisciplinary research within sustainability science studies can be characterized in terms of three key components (following Lang et al., 2012):

# Challenge 3

1. the process phases undertaken within the research project (Pohl and Hirsch Hadorn, 2008a)
2. the types of knowledge which is produced within the project (Pohl and Hirsch Hadorn, 2008a) and
3. the intensity of the involvement of practitioners in the project (Kruetli et al., 2010)



# Challenge 3

Transdisciplinary projects can be divided into three distinct process phases:

1. “problem identification and structuring” where the problem is collaboratively identified,
2. “problem analysis” the co-creation of solution-oriented and transferable knowledge and
3. “integration and application” — the implementation of the results into practice (Pohl and Hirsch Hadorn, 2008a).

# Challenge 3

Knowledge shared between scholars and practitioners within transdisciplinary projects can be categorized in terms of three knowledge types:

1. “system knowledge” the observation of the system,
2. “target knowledge” the knowledge of the desired target state, and
3. “transformation knowledge” the knowledge necessary for fostering transformation processes (ProClim, 1997: 15).

# Challenge 4

- ∞ Practitioners' engagement.
- ∞ The link between practitioners and scientists defines a further crucial element of transdisciplinary approaches; however the involvement of practitioners within transdisciplinary projects can occur at very different intensities.
- ∞ Intensity of involvement ranges from:
  - “Information” which involves one-way communication of information in a more limited form,

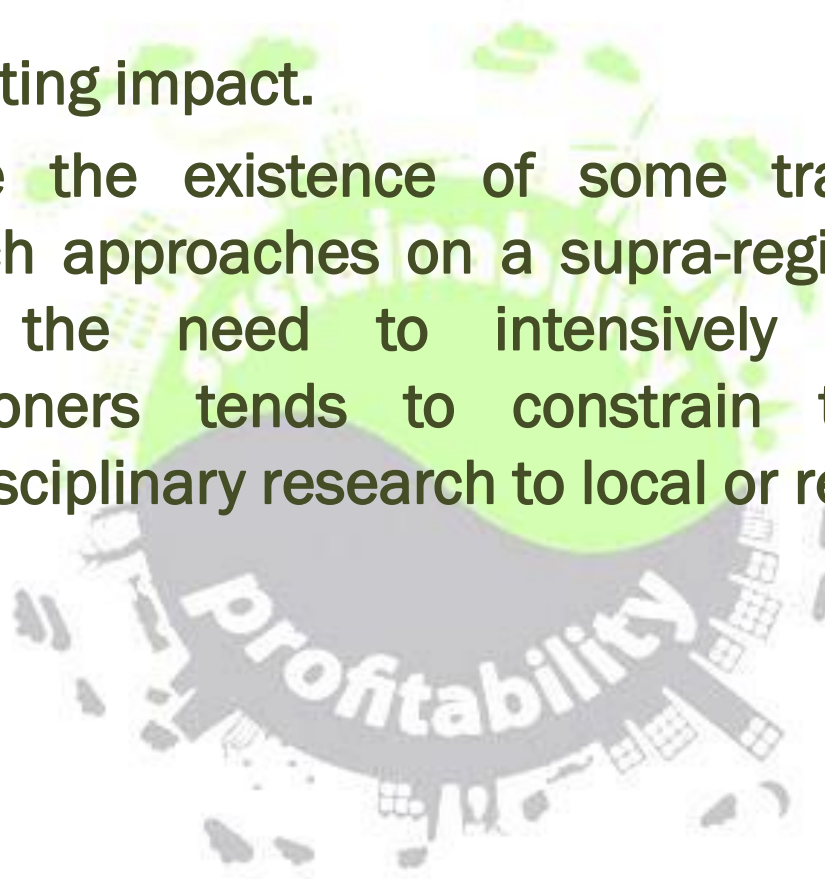
# Challenge 4

- “Consultation” which demands closer communication including responses,
- “Collaboration” which demands that participants have notable influence on the outcome, and
- “Empowerment” here the authority to decide is given to the practitioners (Kruetli et al., 2010).



# Challenge 5

- ∞ Generating impact.
- ∞ Despite the existence of some transdisciplinary research approaches on a supra-regional or global scale, the need to intensively engage with practitioners tends to constrain the focus of transdisciplinary research to local or regional scales.





# Transdisciplinary approach

The challenges of transdisciplinary projects outlined above (coherent framing; method integration; research process and knowledge production; practitioner involvement; generating impact) suggest that it is questionable as to what extent transdisciplinarity is being fully implemented and acknowledged in peer-reviewed sustainability science literature.





# Complex systems

## Dictionary definition:

- ∞ “complex” is: “consisting of interconnected or interwoven parts.”

Why is the nature of a complex system inherently related to its parts?

- ∞ Simple systems are also formed out of parts.
- ∞ To explain the difference between simple and complex systems, the terms “interconnected” or “interwoven” are somehow essential.
- ∞ Qualitatively, to understand the behavior of a complex system we must understand not only the behavior of the parts but how they act together to form the behavior of the whole.

# Complex systems

- ☞ It is because we cannot describe the whole without describing each part, and because each part must be described in relation to other parts, that complex systems are difficult to understand.
- ☞ This is relevant to another definition of “complex”: “not easy to understand or analyze.”



**It is helpful to start by making a list  
of some examples of complex  
systems .**

**Take a few minutes to make your  
own list.**

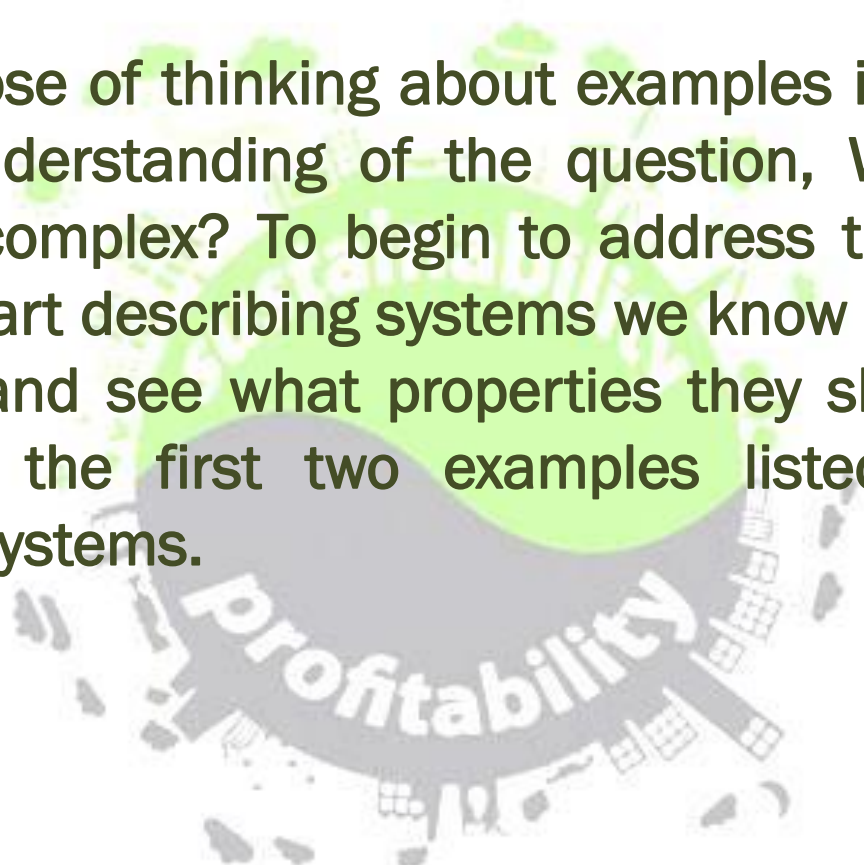


**Now make a list of some simple things to contrast them with.**



# What makes systems complex?

The purpose of thinking about examples is to develop a first understanding of the question, What makes systems complex? To begin to address this question we can start describing systems we know intuitively as complex and see what properties they share. We try this with the first two examples listed above as complex systems.



# Examples of Complex Systems

- ⌘ Governments
- ⌘ Families
- ⌘ The human body—physiological perspective
- ⌘ A person—psychosocial perspective
- ⌘ The brain
- ⌘ The ecosystem of the world
- ⌘ Subworld ecosystems: desert, rain forest, ocean
- ⌘ Weather
- ⌘ A corporation
- ⌘ A computer

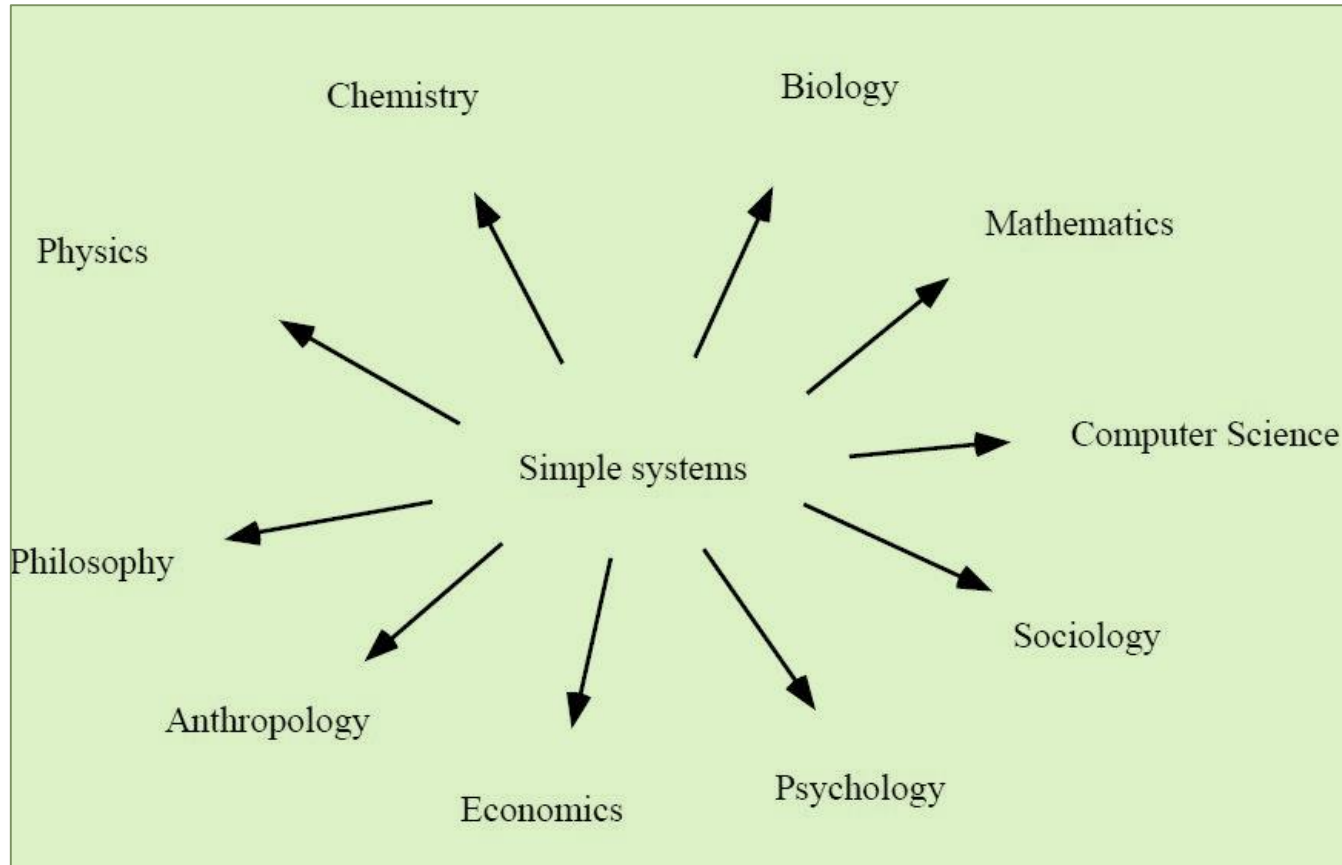
# Examples of Simple Systems

- ∞ An oscillator
- ∞ A pendulum
- ∞ A spinning wheel
- ∞ An orbiting planet

(a) is the conventional view where disciplines diverge as knowledge increases because of the increasing complexity of the various systems being studied. In this view all knowledge is specific and knowledge is gained by providing more and more details.



# Conceptual illustration of the space of scientific inquiry. (a)

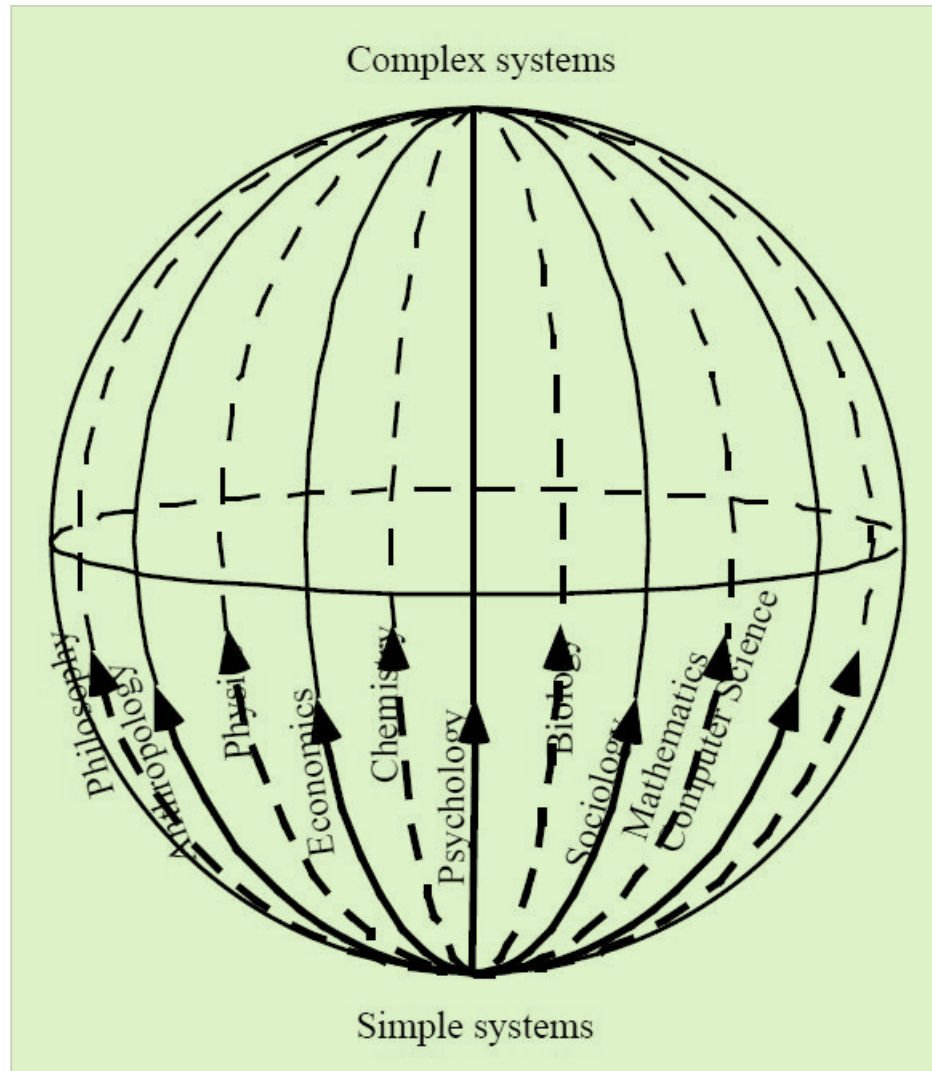




**Conceptual illustration of the space of scientific inquiry. (b)**

(b) illustrates the view of the field of complex systems where complex systems have universal properties. By considering the common properties of complex systems, one can approach the specifics of particular complex systems from the top of the sphere as well as from the bottom.

# Conceptual illustration of the space of scientific inquiry. (b)



# Example

## Government:

- It has many different functions: military, immigration, taxation, income distribution, transportation, regulation. Each function is itself complex.
- There are different levels and types of government: local, state and federal; town meeting, council, mayoral. There are also various governmental forms in different countries.

# Example

## Family:

- It is a set of individuals.
- Each individual has a relationship with the other individuals.
- There is an interplay between the relationship and the qualities of the individual .
- The family has to interact with the outside world.
- There are different kinds of families: nuclear family, extended family, etc.

# Example

- ∞ These descriptions focus on function and structure and diverse manifestation. We can also consider the role that time plays in complex systems. Among the properties of complex systems are change, growth and death, possibly some form of life cycle. Combining time and the environment, we would point to the ability of complex systems to adapt.

# Central properties of complex systems

After beginning to describe complex systems, a second step is to identify commonalities. We might make a list of some of the characteristics of complex systems and assign each of them some measure or attribute that can provide a first method of classification or description.

- Elements (and their number)
- Interactions (and their strength)
- Formation/Operation (and their time scales)
- Diversity/Variability
- Environment (and its demands)
- Activity(-ies) (and its[their] objective[s])



# From elements and parts to complex systems

There are two approaches to organizing the properties of complex systems that will serve as the foundation of our discussions.

The first of these is the relationship between elements, parts and the whole. Since there is only one property of the complex system that we know for sure — that it is complex—the primary question we can ask about this relationship is how the complexity of the whole is related to the complexity of the parts. As we will see, this question is a compelling question for our understanding of complex systems.

# From elements and parts to complex systems

- ❖ The second approach to the study of complex systems begins from an understanding of the relationship of systems to their descriptions.
- ❖ The central issue is defining quantitatively what we mean by complexity. What, after all, do we mean when we say that a system is complex? Better yet, what do we mean when we say that one system is more complex than another?
- ❖ To develop a quantitative understanding of complexity we will use tools of both statistical physics and computer science— information theory and computation theory.
- ❖ According to this understanding, complexity is the amount of information necessary to describe a system.



# Four questions related to the complex systems:

1. Space: What are the characteristics of the structure of complex systems? Many complex systems have substructure that extends all the way to the size of the system itself. Why is there substructure?
2. Time: How long do dynamical processes take in complex systems? Many complex systems have specific responses to changes in their environment that require changing their internal structure. How can a complex structure respond in a reasonable amount of time?

# Four questions related to the complex systems:

3. Self-organization and/versus organization by design: How do complex systems come into existence? What are the dynamical processes that can give rise to complex systems? Many complex systems undergo guided developmental processes as part of their formation. How are developmental processes guided?
4. Complexity: What is complexity? Complex systems have varying degrees of complexity. How do we characterize/ distinguish the varying degrees of complexity?

# Summarizing the two approaches above:

- ❖ The first deals with elements and interactions.
- ❖ The second deals with descriptions and information.
- ❖ Ultimately, our objective is to relate them, but we do so using questions that progress gradually from the elements and interactions to the descriptions and information.

**Consider a few complex systems.  
Make a list of their elements,  
interactions between these  
elements, the mechanism by  
which the system is formed and  
the activities in which the system  
is engaged.**

# Complex Systems and Some Attributes

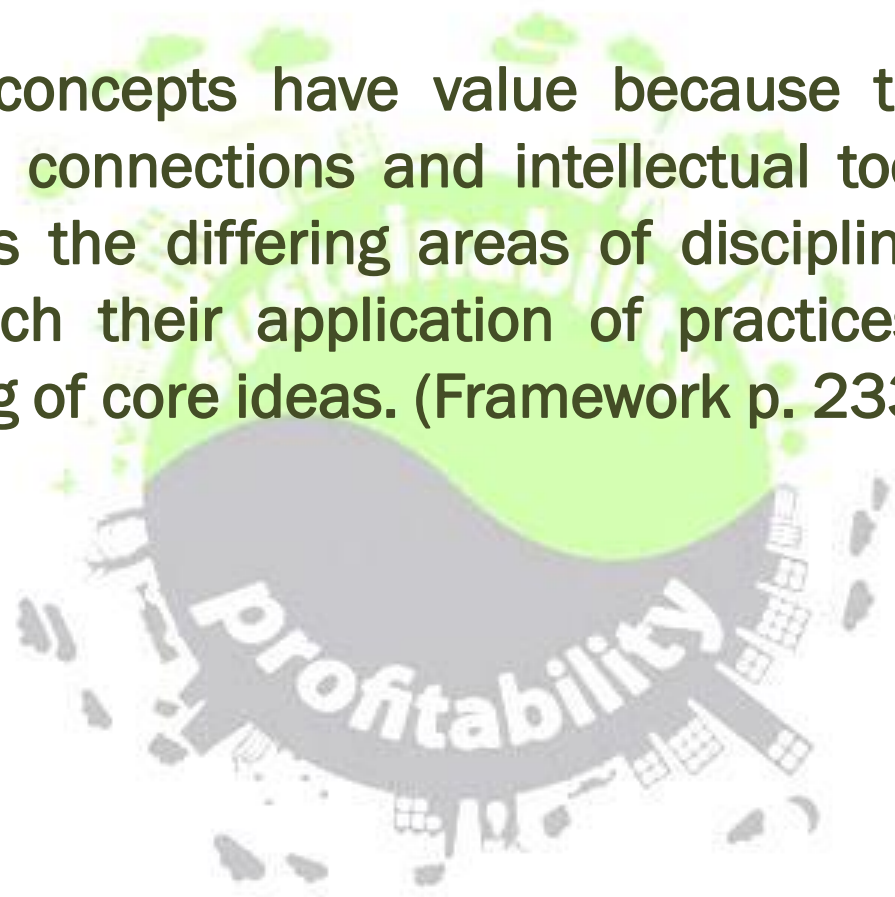
System	Element	Interaction	Formation	Activity
Proteins	Amino Acids	Bonds	Protein folding	Enzymatic activity
Nervous system Neural networks	Neurons	Synapses	Learning	Behavior Thought
Physiology	Cells	Chemical messengers Physical support	Developmental biology	Movement Physiological functions
Life	Organisms	Reproduction Competition Predation Communication	Evolution	Survival Reproduction Consumption Excretion
Human economies and societies	Human Beings Technology	Communication Confrontation Cooperation	Social evolution	Same as Life? Exploration?

Now, let's see how transdisciplinarity and complex systems connects to the core ideas and crosscutting concepts in science education.



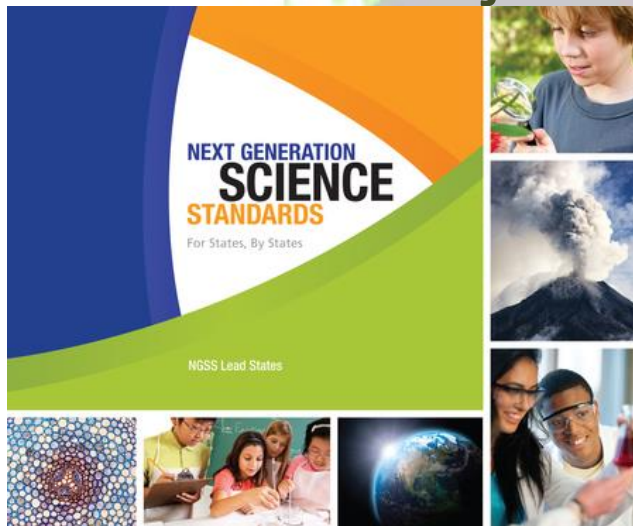
# Crosscutting Concepts

Crosscutting concepts have value because they provide students with connections and intellectual tools that are related across the differing areas of disciplinary content and can enrich their application of practices and their understanding of core ideas. (Framework p. 233)



# The case study of “Framework”

A Framework for K-12 Science Education: Practices, Core Ideas, and Crosscutting Concepts (Framework) recommends science education in grades K-12 be built around three major dimensions: scientific and engineering practices; crosscutting concepts that unify the study of science and engineering through their common application across fields; and core ideas in the major disciplines of natural science.



Framework for K-12 Science Education:  
Practices, Core Ideas, and Crosscutting Concepts



# Crosscutting Concepts

The Framework identifies seven crosscutting concepts that bridge disciplinary boundaries, uniting core ideas throughout the fields of science and engineering. Their purpose is to help students deepen their understanding of the disciplinary core ideas (pp. 2 and 8), and develop a coherent and scientifically based view of the world (p. 83.):

1. *Patterns*
2. Cause and effect
3. Scale, proportion, and quantity

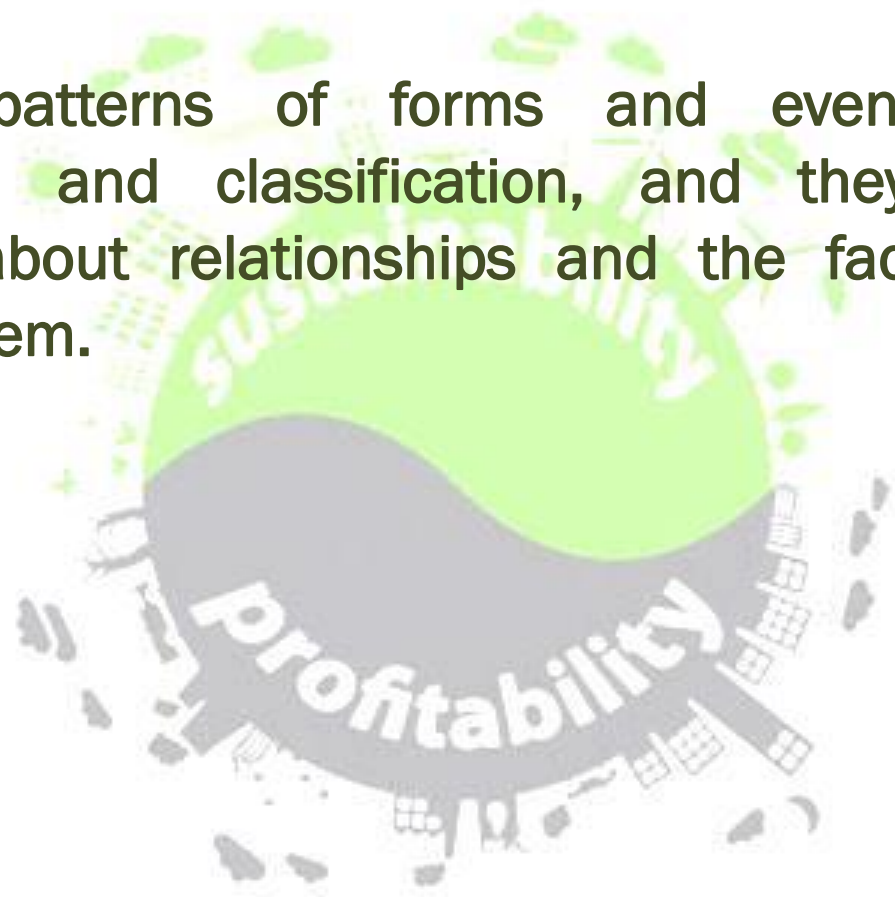
# Crosscutting Concepts

- 4. Systems and system models
- 5. Energy and matter
- 6. Structure and function
- 7. Stability and change



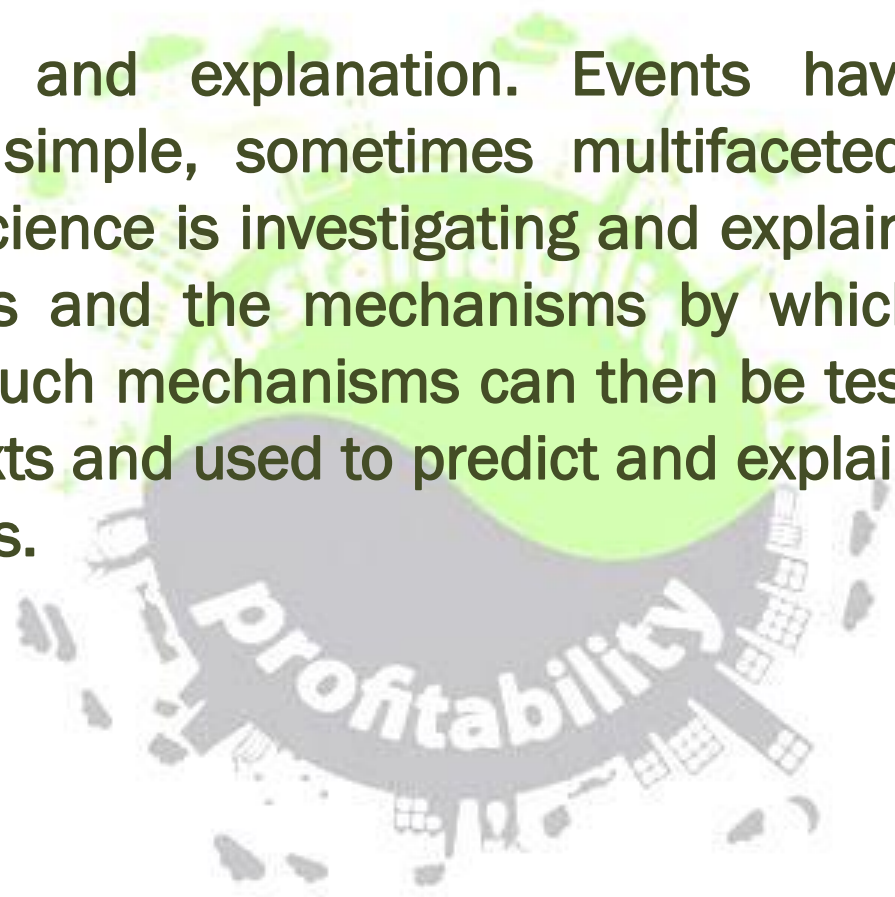
# 1. *Patterns*

Observed patterns of forms and events guide organization and classification, and they prompt questions about relationships and the factors that influence them.



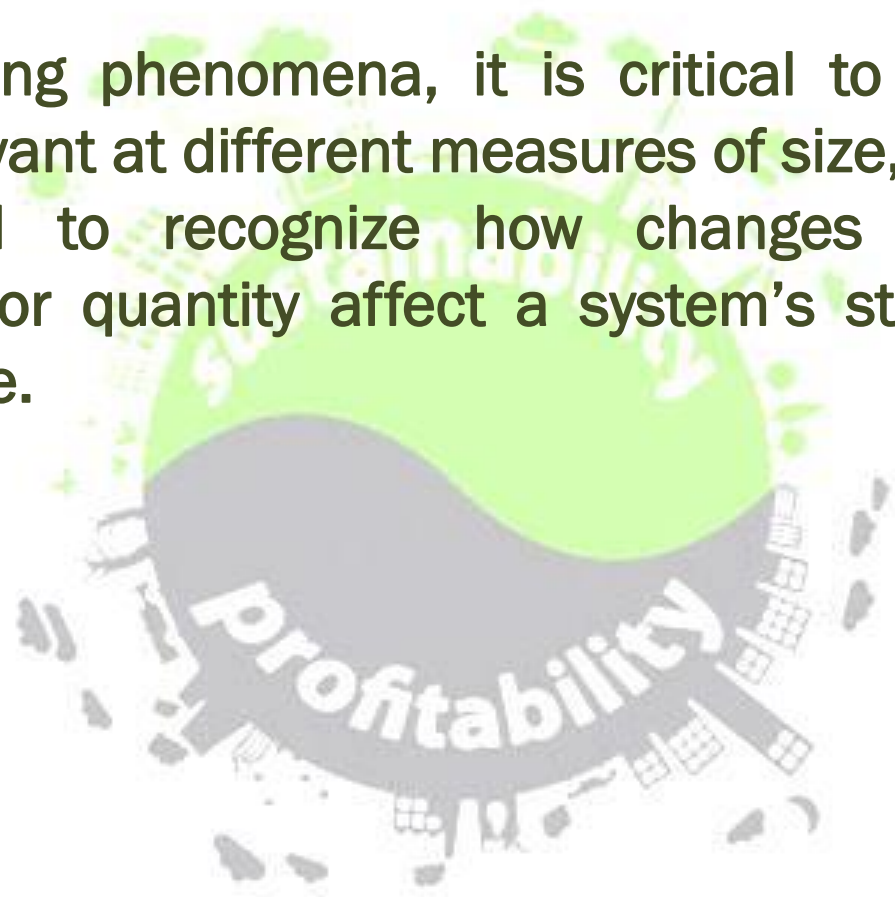
## 2. *Cause and effect*

Mechanism and explanation. Events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts.



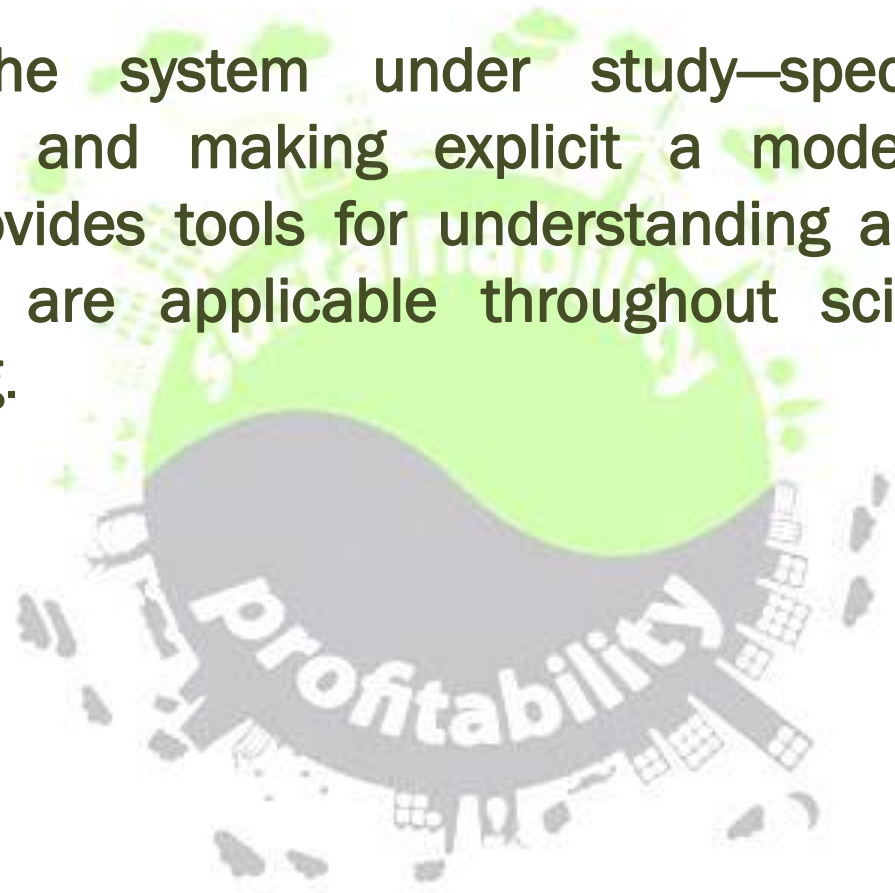
### *3. Scale, proportion, and quantity*

In considering phenomena, it is critical to recognize what is relevant at different measures of size, time, and energy and to recognize how changes in scale, proportion, or quantity affect a system's structure or performance.



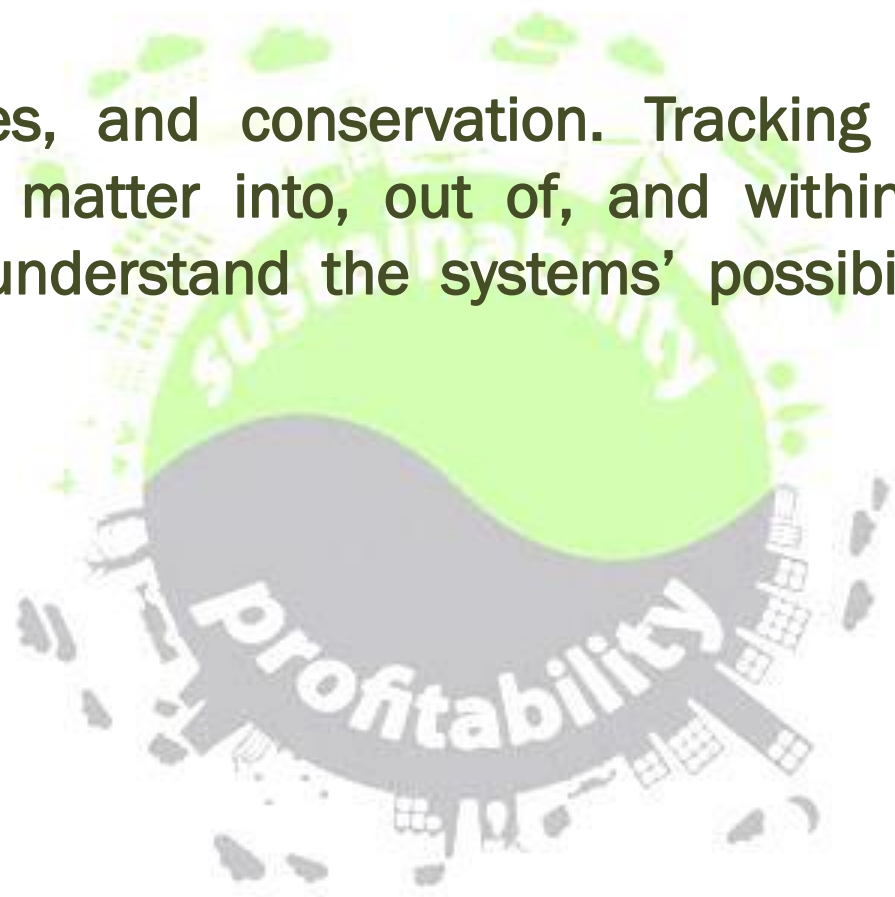
## 4. *Systems and system models.*

Defining the system under study—specifying its boundaries and making explicit a model of that system—provides tools for understanding and testing ideas that are applicable throughout science and engineering.



## 5. *Energy and matter*

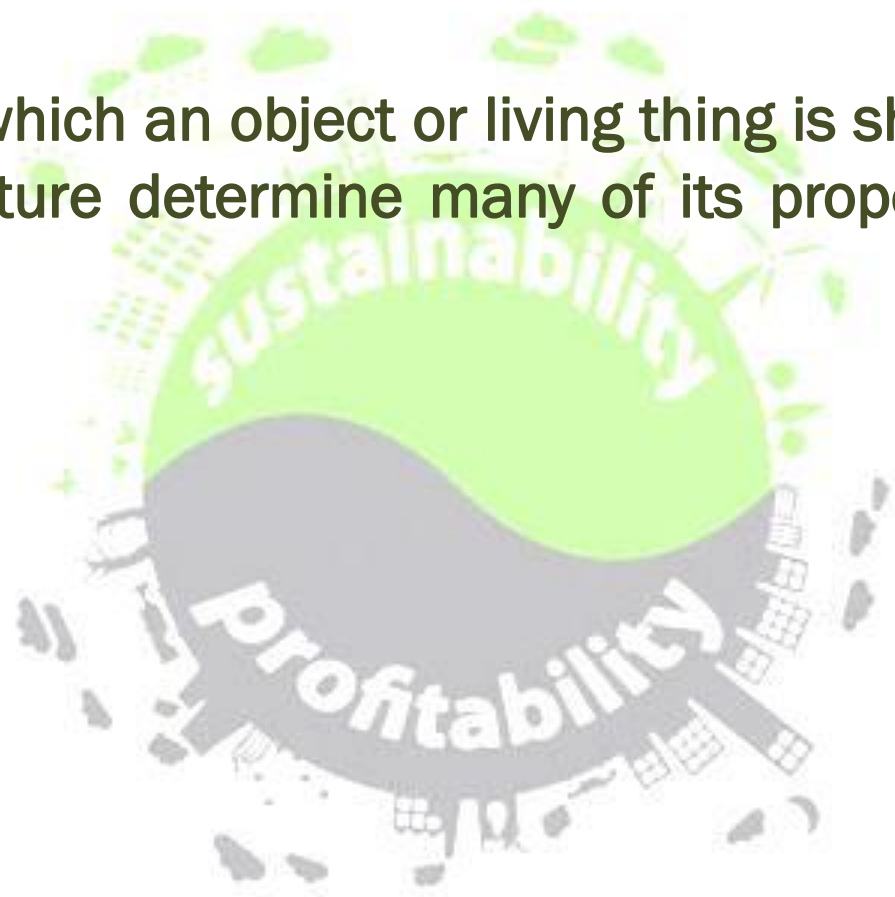
Flows, cycles, and conservation. Tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems' possibilities and limitations.





## 6. *Structure and function*

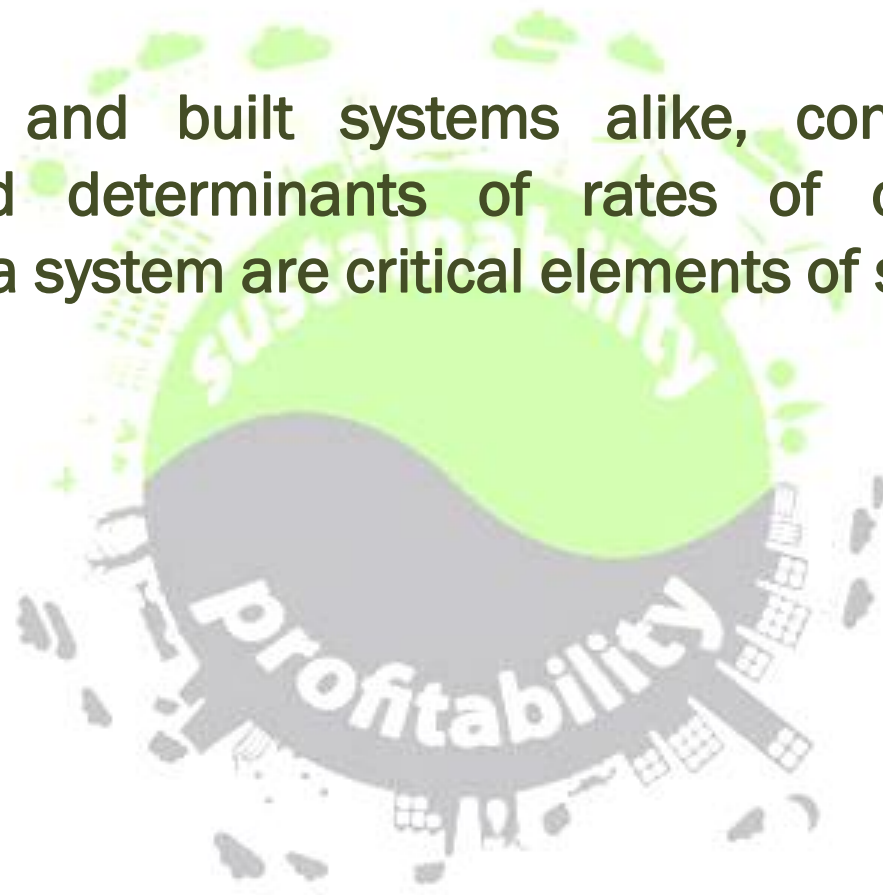
The way in which an object or living thing is shaped and its substructure determine many of its properties and functions.





## *7. Stability and change*

For natural and built systems alike, conditions of stability and determinants of rates of change or evolution of a system are critical elements of study.



# Guiding Principles

The Framework recommended crosscutting concepts be embedded in the science curriculum beginning in the earliest years of schooling and suggested a number of guiding principles for how they should be used. The development process of the standards provided insights into the crosscutting concepts. These insights are shared in the following guiding principles:

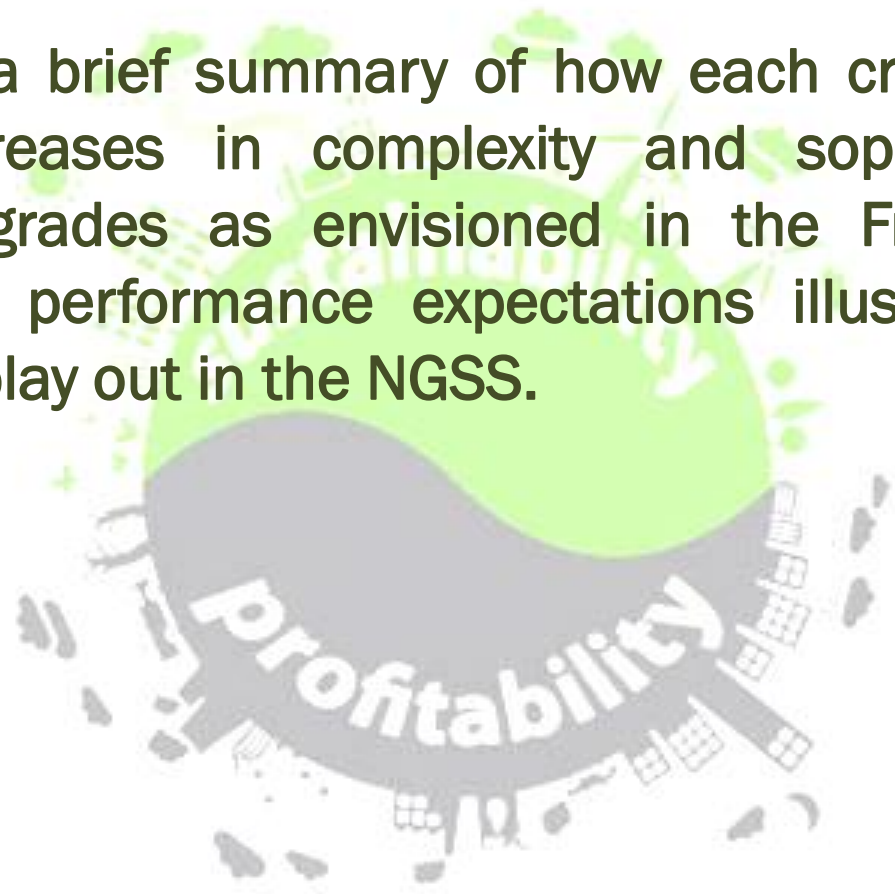
- ∞ Crosscutting concepts can help students better understand core ideas in science and engineering.
- ∞ Crosscutting concepts can help students better understand science and engineering practices.

# Guiding Principles

- ✎ Crosscutting concepts should grow in complexity and sophistication across the grades.
- ✎ Crosscutting concepts can provide a common vocabulary for science and engineering.
- ✎ Crosscutting concepts should not be assessed separately from practices or core ideas.
- ✎ Performance expectations focus on some but not all capabilities associated with a crosscutting concept.
- ✎ Crosscutting concepts are for *all* students.
- ✎ Inclusion of Nature of Science and Engineering Concepts

# Progression of Crosscutting Concepts Across the Grades

Following is a brief summary of how each crosscutting concept increases in complexity and sophistication across the grades as envisioned in the Framework. Examples of performance expectations illustrate how these ideas play out in the NGSS.





# 1. Patterns

Progression Across the Grades	Performance Expectation from the NGSS
<i>In grades K-2</i> , children recognize that patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.	1-ESS1-1. Use observations of the sun, moon, and stars to describe patterns that can be predicted.
<i>In grades 3-5</i> , students identify similarities and differences in order to sort and classify natural objects and designed products. They identify patterns related to time, including simple rates of change and cycles, and to use these patterns to make predictions.	4-PS4-1. Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.
<i>In grades 6-8</i> , students recognize that macroscopic patterns are related to the nature of microscopic and atomic-level structure. They identify patterns in rates of change and other numerical relationships that provide information about natural and human designed systems. They use patterns to identify cause and effect relationships, and use graphs and charts to identify patterns in data.	MS-LS4-1. Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.

# 1. Patterns

*In grades 9-12, students observe patterns in systems at different scales and cite patterns as empirical evidence for causality in supporting their explanations of phenomena. They recognize classifications or explanations used at one scale may not be useful or need revision using a different scale; thus requiring improved investigations and experiments. They use mathematical representations to identify certain patterns and analyze patterns of performance in order to reengineer and improve a designed system.*

HS-PS1-2. Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.

## 2. Cause and effect



Progression Across the Grades	Performance Expectation from the NGSS
<i>In grades K-2</i> , students learn that events have causes that generate observable patterns. They design simple tests to gather evidence to support or refute their own ideas about causes.	1-PS4-3. Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light.
<i>In grades 3-5</i> , students routinely identify and test causal relationships and use these relationships to explain change. They understand events that occur together with regularity might or might not signify a cause and effect relationship.	4-ESS2-1. Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.





## 2. Cause and effect

<p><i>In grades 6-8</i>, students classify relationships as causal or correlational, and recognize that correlation does not necessarily imply causation. They use cause and effect relationships to predict phenomena in natural or designed systems. They also understand that phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.</p>	<p>MS-PS1-4. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.</p>
<p><i>In grades 9-12</i>, students understand that empirical evidence is required to differentiate between cause and correlation and to make claims about specific causes and effects. They suggest cause and effect relationships to explain and predict behaviors in complex natural and designed systems. They also propose causal relationships by examining what is known about smaller scale mechanisms within the system. They recognize changes in systems may have various causes that may not have equal effects.</p>	<p>HS-LS3-2. Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.</p>



# 3. Scale, proportion, and quantity

Progression Across the Grades	Performance Expectation from the NGSS
<i>In grades K-2</i> , students use relative scales (e.g., bigger and smaller; hotter and colder; faster and slower) to describe objects. They use standard units to measure length.	
<i>In grades 3-5</i> , students recognize natural objects and observable phenomena exist from the very small to the immensely large. They use standard units to measure and describe physical quantities such as weight, time, temperature, and volume.	5-ESS1-1. Support an argument that the apparent brightness of the sun and stars is due to their relative distances from Earth.
<i>In grades 6-8</i> , students observe time, space, and energy phenomena at various scales using models to study systems that are too large or too small. They understand phenomena observed at one scale may not be observable at another scale, and the function of natural and designed systems may change with scale. They use proportional relationships (e.g., speed as the ratio of distance traveled to time taken) to gather information about the magnitude of properties and processes. They represent scientific relationships through the use of algebraic expressions and equations.	MS-LS1-1. Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.

# 3. Scale, proportion, and quantity

*In grades 9-12*, students understand the significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs. They recognize patterns observable at one scale may not be observable or exist at other scales, and some systems can only be studied indirectly as they are too small, too large, too fast, or too slow to observe directly. Students use orders of magnitude to understand how a model at one scale relates to a model at another scale. They use algebraic thinking to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth).

HS-ESS1-4. Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.



## 4. *Systems and system models.*

Progression Across the Grades	Performance Expectation from the NGSS
<i>In grades K-2</i> , students understand objects and organisms can be described in terms of their parts; and systems in the natural and designed world have parts that work together.	K-ESS3-1. Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.
<i>In grades 3-5</i> , students understand that a system is a group of related parts that make up a whole and can carry out functions its individual parts cannot. They can also describe a system in terms of its components and their interactions.	3-LS4-4. Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.
<i>In grades 6-8</i> , students can understand that systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. They can use models to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems. They can also learn that models are limited in that they only represent certain aspects of the system under study.	MS-PS2-4. Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.

## 4. *Systems and system models.*

*In grades 9-12*, students can investigate or analyze a system by defining its boundaries and initial conditions, as well as its inputs and outputs. They can use models (e.g., physical, mathematical, computer models) to simulate the flow of energy, matter, and interactions within and between systems at different scales. They can also use models and simulations to predict the behavior of a system, and recognize that these predictions have limited precision and reliability due to the assumptions and approximations inherent in the models. They can also design systems to do specific tasks.

HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.



## 5. *Energy and matter*

Progression Across the Grades	Performance Expectation from the NGSS
<i>In grades K-2</i> , students observe objects may break into smaller pieces, be put together into larger pieces, or change shapes.	2-PS1-3. Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.
<i>In grades 3-5</i> , students learn matter is made of particles and energy can be transferred in various ways and between objects. Students observe the conservation of matter by tracking matter flows and cycles before and after processes and recognizing the total weight of substances does not change.	5-LS1-1. Support an argument that plants get the materials they need for growth chiefly from air and water.
<i>In grades 6-8</i> , students learn matter is conserved because atoms are conserved in physical and chemical processes. They also learn within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter. Energy may take different forms (e.g. energy in fields, thermal energy, energy of motion). The transfer of energy can be tracked as energy flows through a designed or natural system.	MS-ESS2-4. Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.

## 5. *Energy and matter*

*In grades 9-12*, students learn that the total amount of energy and matter in closed systems is conserved. They can describe changes of energy and matter in a system in terms of energy and matter flows into, out of, and within that system. They also learn that energy cannot be created or destroyed. It only moves between one place and another place, between objects and/or fields, or between systems. Energy drives the cycling of matter within and between systems. In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved.

HS-PS1-8. Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.



## 6. *Structure and function*

Progression Across the Grades	Performance Expectation from the NGSS
<i>In grades K-2</i> , students observe the shape and stability of structures of natural and designed objects are related to their function(s).	2-LS2-2. Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants
<i>In grades 3-5</i> , students learn different materials have different substructures, which can sometimes be observed; and substructures have shapes and parts that serve functions.	
<i>In grades 6-8</i> , students model complex and microscopic structures and systems and visualize how their function depends on the shapes, composition, and relationships among its parts. They analyze many complex natural and designed structures and systems to determine how they function. They design structures to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used.	MS-PS4-2. Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.



## 6. *Structure and function*

*In grades 9-12*, students investigate systems by examining the properties of different materials, the structures of different components, and their interconnections to reveal the system's function and/or solve a problem. They infer the functions and properties of natural and designed objects and systems from their overall structure, the way their components are shaped and used, and the molecular substructures of their various materials.

HS-ESS2-5. Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.

# 7. Stability and change

Progression Across the Grades	Performance Expectation from the NGSS
<i>In grades K-2</i> , students observe some things stay the same while other things change, and things may change slowly or rapidly.	2-ESS2-1. Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.
<i>In grades 3-5</i> , students measure change in terms of differences over time, and observe that change may occur at different rates. Students learn some systems appear stable, but over long periods of time they will eventually change.	
<i>In grades 6-8</i> , students explain stability and change in natural or designed systems by examining changes over time, and considering forces at different scales, including the atomic scale. Students learn changes in one part of a system might cause large changes in another part, systems in dynamic equilibrium are stable due to a balance of feedback mechanisms, and stability might be disturbed by either sudden events or gradual changes that accumulate over time	MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

## 7. *Stability and change*

*In grades 9-12*, students understand much of science deals with constructing explanations of how things change and how they remain stable. They quantify and model changes in systems over very short or very long periods of time. They see some changes are irreversible, and negative feedback can stabilize a system, while positive feedback can destabilize it. They recognize systems can be designed for greater or lesser stability.

HS-PS1-6. Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.



# Crosscutting Concepts Matrix

**1. Patterns** – Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

## K-2 Crosscutting Statements

- Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.

## 3-5 Crosscutting Statements

- Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena and designed products.
- Patterns of change can be used to make predictions.
- Patterns can be used as evidence to support an explanation.

## 6-8 Crosscutting Statements

- Macroscopic patterns are related to the nature of microscopic and atomic-level structure.
- Patterns in rates of change and other numerical relationships can provide information about natural and human designed systems.
- Patterns can be used to identify cause and effect relationships.
- Graphs, charts, and images can be used to identify patterns in data.

## 9-12 Crosscutting Statements

- Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.
- Classifications or explanations used at one scale may fail or need revision when information from smaller or larger scales is introduced; thus requiring improved investigations and experiments.
- Patterns of performance of designed systems can be analyzed and interpreted to reengineer and improve the system.
- Mathematical representations are needed to identify some patterns.
- Empirical evidence is needed to identify patterns.

**2. Cause and Effect: Mechanism and Prediction** – Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.

## K-2 Crosscutting Statements

- Events have causes that generate observable patterns.
- Simple tests can be designed to gather evidence to support or refute student ideas about causes.

## 3-5 Crosscutting Statements

- Cause and effect relationships are routinely identified, tested, and used to explain change.
- Events that occur together with regularity might or might not be a cause and effect relationship.

## 6-8 Crosscutting Statements

- Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.
- Cause and effect relationships may be used to predict phenomena in natural or designed systems.
- Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.

## 9-12 Crosscutting Statements

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.
- Cause and effect relationships can be suggested and predicted for complex natural and human designed systems by examining what is known about smaller scale mechanisms within the system.
- Systems can be designed to cause a desired effect.
- Changes in systems may have various causes that may not have equal effects.



# Crosscutting Concepts Matrix

**3. Scale, Proportion, and Quantity** – In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.

K-2 Crosscutting Statements	3-5 Crosscutting Statements	6-8 Crosscutting Statements	9-12 Crosscutting Statements
<ul style="list-style-type: none"> <li>Relative scales allow objects and events to be compared and described (e.g., bigger and smaller; hotter and colder; faster and slower).</li> <li>Standard units are used to measure length.</li> </ul>	<ul style="list-style-type: none"> <li>Natural objects and/or observable phenomena exist from the very small to the immensely large or from very short to very long time periods.</li> <li>Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.</li> </ul>	<ul style="list-style-type: none"> <li>Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.</li> <li>The observed function of natural and designed systems may change with scale.</li> <li>Proportional relationships (e.g., speed as the ratio of distance traveled to time taken) among different types of quantities provide information about the magnitude of properties and processes.</li> <li>Scientific relationships can be represented through the use of algebraic expressions and equations.</li> <li>Phenomena that can be observed at one scale may not be observable at another scale.</li> </ul>	<ul style="list-style-type: none"> <li>The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs.</li> <li>Some systems can only be studied indirectly as they are too small, too large, too fast, or too slow to observe directly.</li> <li>Patterns observable at one scale may not be observable or exist at other scales.</li> <li>Using the concept of orders of magnitude allows one to understand how a model at one scale relates to a model at another scale.</li> <li>Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth).</li> </ul>

**4. Systems and System Models** – A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.

K-2 Crosscutting Statements	3-5 Crosscutting Statements	6-8 Crosscutting Statements	9-12 Crosscutting Statements
<ul style="list-style-type: none"> <li>Objects and organisms can be described in terms of their parts.</li> <li>Systems in the natural and designed world have parts that work together.</li> </ul>	<ul style="list-style-type: none"> <li>A system is a group of related parts that make up a whole and can carry out functions its individual parts cannot.</li> <li>A system can be described in terms of its components and their interactions.</li> </ul>	<ul style="list-style-type: none"> <li>Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems.</li> <li>Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems.</li> <li>Models are limited in that they only represent certain aspects of the system under study.</li> </ul>	<ul style="list-style-type: none"> <li>Systems can be designed to do specific tasks.</li> <li>When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models.</li> <li>Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales.</li> <li>Models can be used to predict the behavior of a system, but these predictions have limited precision and reliability due to the assumptions and approximations inherent in models.</li> </ul>



# Crosscutting Concepts Matrix

## 5. Energy and Matter: Flows, Cycles, and Conservation – Tracking energy and matter flows, into, out of, and within systems helps one understand their system's behavior.

K-2 Crosscutting Statements	3-5 Crosscutting Statements	6-8 Crosscutting Statements	9-12 Crosscutting Statements
<ul style="list-style-type: none"> <li>Objects may break into smaller pieces, be put together into larger pieces, or change shapes.</li> </ul>	<ul style="list-style-type: none"> <li>Matter is made of particles.</li> <li>Matter flows and cycles can be tracked in terms of the weight of the substances before and after a process occurs. The total weight of the substances does not change. This is what is meant by conservation of matter. Matter is transported into, out of, and within systems.</li> <li>Energy can be transferred in various ways and between objects.</li> </ul>	<ul style="list-style-type: none"> <li>Matter is conserved because atoms are conserved in physical and chemical processes.</li> <li>Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter.</li> <li>Energy may take different forms (e.g. energy in fields, thermal energy, energy of motion).</li> <li>The transfer of energy can be tracked as energy flows through a designed or natural system.</li> </ul>	<ul style="list-style-type: none"> <li>The total amount of energy and matter in closed systems is conserved.</li> <li>Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system.</li> <li>Energy cannot be created or destroyed—only moves between one place and another place, between objects and/or fields, or between systems.</li> <li>Energy drives the cycling of matter within and between systems.</li> <li>In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved.</li> </ul>

## 6. Structure and Function – The way an object is shaped or structured determines many of its properties and functions.

K-2 Crosscutting Statements	3-5 Crosscutting Statements	6-8 Crosscutting Statements	9-12 Crosscutting Statements
<ul style="list-style-type: none"> <li>The shape and stability of structures of natural and designed objects are related to their function(s).</li> </ul>	<ul style="list-style-type: none"> <li>Different materials have different substructures, which can sometimes be observed.</li> <li>Substructures have shapes and parts that serve functions.</li> </ul>	<ul style="list-style-type: none"> <li>Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts; therefore, complex natural and designed structures/systems can be analyzed to determine how they function.</li> <li>Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used.</li> </ul>	<ul style="list-style-type: none"> <li>Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem.</li> <li>The functions and properties of natural and designed objects and systems can be inferred from their overall structure, the way their components are shaped and used, and the molecular substructures of its various materials.</li> </ul>

# Crosscutting Concepts Matrix



**7. Stability and Change** – For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.

K-2 Crosscutting Statements	3-5 Crosscutting Statements	6-8 Crosscutting Statements	9-12 Crosscutting Statements
<ul style="list-style-type: none"> <li>Some things stay the same while other things change.</li> <li>Things may change slowly or rapidly.</li> </ul>	<ul style="list-style-type: none"> <li>Change is measured in terms of differences over time and may occur at different rates.</li> <li>Some systems appear stable, but over long periods of time will eventually change.</li> </ul>	<ul style="list-style-type: none"> <li>Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales, including the atomic scale.</li> <li>Small changes in one part of a system might cause large changes in another part.</li> <li>Stability might be disturbed either by sudden events or gradual changes that accumulate over time.</li> <li>Systems in dynamic equilibrium are stable due to a balance of feedback mechanisms.</li> </ul>	<ul style="list-style-type: none"> <li>Much of science deals with constructing explanations of how things change and how they remain stable.</li> <li>Change and rates of change can be quantified and modeled over very short or very long periods of time. Some system changes are irreversible.</li> <li>Feedback (negative or positive) can stabilize or destabilize a system.</li> <li>Systems can be designed for greater or lesser stability.</li> </ul>





# References

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- Dodds P. S, (2013). Overview: The Dynamics of Complex Systems — Examples, Questions, Methods and Concepts.
- Duschl R. A, (2012). The Second Dimension—Crosscutting Concepts Understanding A Framework for K–12 Science Education .

# Thank you for your attention!!!



خطوة خضراء  
لغدٍ مستدام

A GREEN STEP  
TOWARDS  
A SUSTAINABLE  
TOMORROW

**METODI TA'  
PARTEČIPAZZJONI  
FIL-ĠESTJONI  
SOSTENIBBLI TAR-  
RIŻORSI NATURALI**

**PARTICIPATING  
METHODS IN  
SUSTAINABLE  
MANAGEMENT OF  
NATURAL RESOURCES**



# Metodi ta' parteċipazzjoni fil-ġestjoni sostenibbli tar-riżorsi naturali

## Participating methods in sustainable management of natural resources

### Modulu / Module 4

#### Organizzazzjonijiet Parteċipanti / Participating Organizations:

University of Naples (UNINA)

<http://www.unina.it/home>

- Emilio Balzano, Aggregate Professor
- Caterina Miele, Post-Doctoral Fellow
- Marco Serpico, Research Associate

University of Ioannina (UOI)

<http://www.uoi.gr/en/>

- Katerina Plakitsi, Associate Professor
- Athina Christina Kornelaki, PhD student

The teaching language at the University of Malta is English and therefore the course content is being presented in the English language to be used by any Maltese students/learners.

Il-lingwa tat-tagħlim fl-Università ta' Malta hija l-Ingliż u għalhekk il-kontenut tal-kors qed jiġi ppreżentat bil-lingwa Ingliża għal-użu tal-istudenti Maltin.

# WASTE EMERGENCY AND GOOD PRACTICES IN SOUTHERN ITALY.

## Case Study and Field Study

3

### TABLE OF CONTENTS

- Objectives
- What the module is about
- Type/methods
- Case study n. 1
- Case study n. 2
- Your Task 1: Read and think
- Your Task 2: Start working in groups
- Your task 3: Make a field experience
- Your task 4: Figure out alternative paths

## 1

# OBJECTIVES

- ❑ Exploring the basic concepts of modern waste management policies
- ❑ Comparing solutions proposed and implemented in an emblematic waste management emergency
- ❑ Identifying their environmental, economic, social and cultural consequences
- ❑ Focusing on different points of view (policymakers / inhabitants)
- ❑ Field experience of sustainable practices in waste management.



## 2

# WHAT THE MODULE IS ABOUT

What do we mean by Waste Management (WM)?

The terms WM refer to all the cycle of actions required to manage the waste produced through residential and industrial activities in order to reduce its impact on the environment and public health.

Historically WM has always been managed by humanity at very local level and has been strongly based on reuse of materials.

The modern era of WM starts in the nineteenth century with the industrial revolution and the consequent exponential growth in the production of urban, agricultural and industrial waste.

Nowadays WM is a rather complex issue that includes the collection, transport, treatment, recycling and disposal of waste and needs to be monitored and regulated at the local, regional, national and international levels.

## 3

# WHAT THE MODULE IS ABOUT

Basic concepts of WM

Among the basic concepts of modern WM the most important is surely that of **waste hierarchy**, which may be explained through its three main keywords

Reduce, Reuse, Recycle

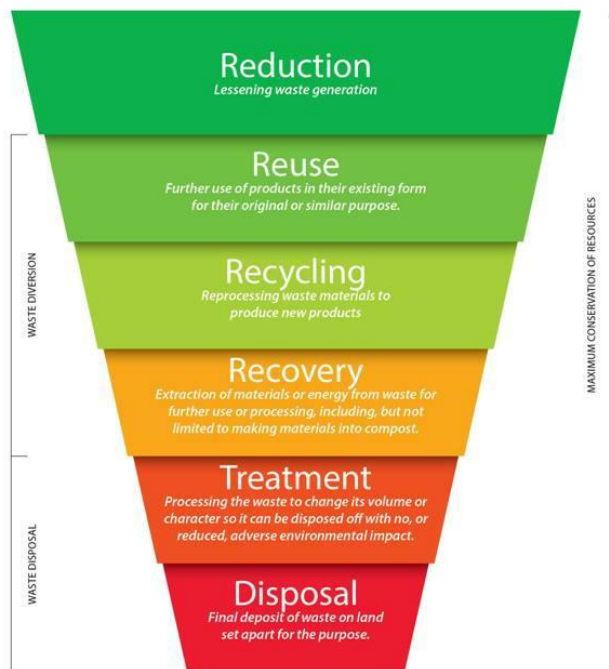
That are often referred to as the “3 Rs”

The waste hierarchy concept is usually represented through pyramidal diagrams that reflect the hierarchal relationships among the different actions that can be undertaken in order to set up WM cycles: apart from the 3 Rs, which are intended to be more virtuous and environment- and health-friendly actions, these include Recovery, Treatment and, as a last resource, Disposal.

4

# WHAT THE MODULE IS ABOUT

## The waste hierarchy pyramid



Source:

<https://greenerneighbourhoods.net/resources/waste>

## 5

# WHAT THE MODULE IS ABOUT

## Basic concepts of WM

Strongly connected to the waste hierarchy concept is the one of **Life-cycle of a product**, which refers to all the action that can be undertaken (and possibly regulated) in order to make the production, packaging and distribution of any kind of product more adequate to a “3Rs-oriented” WM cycle.

Policies (and legislations) that are based on the principle are becoming more and more widespread, especially in western countries.

One very interesting issue connected to the idea of life-cycle, which is producing huge debate and controversy (and, in some countries, also the planning of devoted a very strict legislation), is that of **planned obsolescence** (the planning or designing of a product which intrinsically includes an artificially limited lifespan or duration of usability).

## 6

# WHAT THE MODULE IS ABOUT

## Basic concepts of WM

From a legal point of view, the most important principle of WM is the so-called **polluter pays** principle, which is at the basis of environmental legislation worldwide.

The idea behind this principle is that any kind of damage caused by pollutants on the environment is full responsibility of the person(s) or body who produced the pollutants.

The principle is also connected to specific environmental laws that impose to polluters to cover all the expenses needed to recover a polluted area and, during the last years, to the so-called “eco-taxes” that are aimed at penalising companies that does not fully respect protocols for environment preservation.

## 7

# WHAT THE MODULE IS ABOUT

Basic concepts of WM

Another important concept in modern WM is the one of **Resource Recovery**, which includes all the actions aimed at the reuse of already disposed materials, such as recycling, composting and energy generation.

All these actions aim at reducing the consumption of virgin resources and the amount and provide profitable alternatives to landfill disposal.

This concept is at the basis of all modern solid waste management in urban areas and is strictly connected to the need of separating waste in order to make it more easily reused.



## 8

# WHAT THE MODULE IS ABOUT

A focus on urban solid waste management

In order to explore the meaning and the relevance of the basic concepts of WM that have been introduced, this module focuses on a waste emergency case study which has attracted the attention of the worldwide for two main reasons:

It happened in a western developed country (Italy)

One of the effects of the crisis was the stoppage (for long periods) of urban waste collection, which resulted in huge amounts of rubbish invading the streets of the city of Naples

## 9

# WHAT THE MODULE IS ABOUT

The waste emergency in Campania Region, Italy

From 1994 to early 2008, the Italian government declared the State of Emergency in Campania region due to the saturation of regional waste treatment facilities. The accumulation of waste, illegal and legal, urban and industrial, contaminated soil, water and the air.

Since the government had to use military force to make citizens accept in their territory the creation of incinerators or landfills, the crisis increased public unrest and exacerbated the conflict.

The emergency also made clear the involvement of criminal organizations in the waste management industry.

## 10

# WHAT THE MODULE IS ABOUT

The waste emergency in Campania Region, Italy

An indirect effect of the waste emergence is the rising of a new widespread awareness in Campania region inhabitants about social impacts and environmental damages that can derive from a wrong use of natural resources or an incorrect management of waste.

From 2008 different kind of experiences (social movements, cooperatives, associations, etc.) emerged with the aim of promoting and practicing a sustainable management of natural resources and solid urban waste.

## 11

## CASE STUDY 1

## The waste emergency in Campania Region, Italy

There is growing evidence, including a World Health Organisation study of the region, that the accumulation of waste, illegal and legal, urban and industrial, has contaminated soil, water, and the air with a range of toxic pollutants including dioxins. A high correlation between incidences of cancer, respiratory illnesses, and genetic malformations and the presence of industrial and toxic waste landfills was also found. The Government has been unable to resolve this crisis, adopting measures that have only increased public unrest, exacerbating the conflict. Local communities continue to organise and protest, risking arrest in order to be heard by a Government that has so far excluded them from decisionmaking processes. Meanwhile the management of waste has worsened: from the failure to separate dry from wet waste and the resultant inability to produce compost (necessary for the regeneration of contaminated land) to the continued production of the inaccurately named “ecoballs” that have continued to accumulate due to delays in the construction of incinerators. These delays have necessitated the creation of new stocking areas, the re-opening of old landfills and the creation of new ones. Although Illegal waste management is currently one of the most urgent environmental issues in Italy, public opinion and the media remain silent on the matter.

Source: Greyl, L., Vegni, S., Natalicchio, M., Cure, S. and Ferretti, J., *The waste crisis in Campania region*, 2012

## 12

## CASE STUDY 2

## The case of the “Land of Fires” in Campania Region, Italy

The “Land of Fires” indicates an area in Campania, in the south of Italy where, systematically, since the end of the ‘80s, toxic wastes have been dumped by organized crime. Although in the public opinion the mafia clans are the most important subjects involved in the illegal waste trafficking, a significant role is also played in this field by many businessmen and firms. Corruption is a crucial element that connects all these actors in the waste sector, characterized by the grant of public licenses and authorizations. Moreover, this sector needs large economic investments and has to face a huge bureaucratic machine, which makes the ground even more fertile for corruption. All these conditions hamper the competition and facilitate the creation and the development of oligopolistic forces, where the strength of mafia intimidation turns out to be particularly effective. The weak (or the absolute lack of) enforcement power at both national and regional levels has been used to explain this widespread illegal situation, but responsibilities actually lie at various governance levels, spanning from inefficient bureaucracy to political patronage and criminal malfeasance. Moreover, the lack of adequate (and effectively enforced) waste management policies has created institutional and regulatory uncertainty which fosters the illegal market of waste.

Source: D’Alisa, G., P.M. Falcone, A.R. Germani, C. Imbriani, P. Morone, F. Reganati, *Victims in the “Land of Fires”: A case study on the consequences of buried and burnt waste in Campania, Italy*, 2015

# TYPE/METHODS

- Analysis (Issues),
- Debate,
- Dilemma/Decision,
- Discussion,
- Role-Play
- Fieldwork



## 14

## YOUR TASK - 1

**Read and think!** Analyze the case study trying to answer the following questions:

- What's the context, key characters, and setting(s)?
- How does this case relate to course content?
- What are the primary issues and the different perspectives?
- What are possible solutions, alternative approaches, and consequences of various paths?
- What are the pros and cons for each approach or solution?
- How does this case generalize to the "real world"?

## 15

## YOUR TASK - 2

**Start working in groups!** Break up the case in many parts and try to stress the actors' different points of view or the multilevel impact (economic, social, cultural) of the considered problematic:

- Seek multiple options and solutions
- Keep an open mind
- Look at multiple perspectives
- View the spectrum of options from one extreme to another
- Look for holes in assumptions and generalizations
- Evaluate evidence
- Make informed decisions

## 16

## YOUR TASK - 3

**Make a field experience!** Make a field experience of good practices in recycling and sustainable management of natural resources in your region. Visit organizations and associations and compare sustainable projects of waste management really implemented in Campania region after the waste emergency:

- Experience settings that reflects course content.
- Make observations of social interactions and activities.
- Gather data for problem solving or discussions.
- Consider using different tools to record experiences and observations (Digital still camera, Sketches or drawings, Notes, Video camera)

## 17

## YOUR TASK - 4

**Figure out alternative paths!** Try to elaborate innovative environmental-sensitive solutions and to identify the consequences of its application to the case study:

- Present a specific situation or set of facts
- Use websites, online reports and documents
- Ask "what if" questions
- What would you do? Take a stand. Use evidence to justify the position
- Discuss your final considerations with your class



**Titolu tal-kors: KORS II – L-istat kurrenti u ġejjieni taż-żona tal-Baltiku u l-Mediterran f'perspettiva interdixxiplinari**

**Organizzazzjonijiet parteċipanti:** Università ta' Ioannina, Università ta' Helsinki

**DESKRIZZJONI:**

Dan il-kors jesplora l-istat preżenti u futur tal-Baltiku u ż-żona tal-Mediterran permezz ta' approċċi interdixxiplinari. Ir-Reġjun tal-Baħar Baltiku speċifikament jokkupa diversi pajjiżi u kollha kemm huma jiffurmaw Kunsill tan-Nazzjonijiet tal-Baħar Baltiku. Min-naħa l-oħra, il-Baħar Mediterran ikopri porzjonijiet ta' tliet kontinenti: l-Afrika, l-Asja u l-Ewropa. Barra minn hekk, dan il-qasam jinkludi l-klima Mediterranja, li huwa responsabbli għall-flora rikka tagħha fir-reġjuni kollha. Fl-aħħarnett, iż-żewġ ibħra qegħdin jiffaċċaw għadd ta' problemi marbutin mal-ambjent, u għalhekk dan il-kors ser jipprova jsemmi dawn il-problemi, jistudjhom u naturalment jagħti xi soluzzjonijiet.

**Kontenut tal-kors:**

- Il-kwistjoni ta' sustanzi perikolużi u tossiċi i mill-fabbriki u l-attivitàjiet agrikoli, trasport marittimu, eċċ li jilfu qu l-Baħar Baltiku kif ukoll depożiti ta' fjuwil illegali mill-vapuri u ajruplani. Soluzzjonijiet.
- Il-problema tal-ewtrofikazzjoni u l-estinzjoni ta' speċi tal-baħar u l-kwalità tal-ilma fil-Baħar Baltiku u l-Baħar Mediterran. Soluzzjonijiet.
- Programm ta' studju ta' każ ijet: Pjan ta' Azzjoni għall-Baħar Baltiku. Parteċipazzjoni neċessarja.
- L-istorja, li-ġeoloġija, il-klima u l-bijodiversità tal-Baltiku u l-Mediterran.
- Studju tal-istatus ekonomiku, politiku, soċjali u kulturali taż-żewġ reġjuni. Paraguni.
- Konċentrazzjoni u bjoakkumulazzjoni ta' residwi ta' pestiċidi organoklorin fl-għasafar u priżma tagħhom fil-artijiet taż-żona tal-Mediterran.
- L-istatus ta' tniġġis tal-pestiċidi fl-ilmijiet tal-wiċċ (xmajjar u lagi) tal-Mediterran u l-Baħar Baltiku.
- Sforzi reġjonali biex jinstabu soluzzjonijiet għall-problemi ambjentali kollettivi li jindirizzaw direttament lill-pajjiżi i affettwati.
- Valutazzjoni tar-riskju ekoloġiku ta' agrokimiċi i fl-estwarji Ewropej.
- Informazzjoni u sensibilizzazzjoni għall-aċċittadini Ewropej kollha u mhux biss liċċittadini tar-reġjuni speċifiċi i
- Ir-rwol kontroversjali tal-Unjoni Ewropea dwar kooperazzjoni bejn iż-żewġ reġjuni.

**Metodi ta' Tagħlim għall-Kors**

- Lectures
- Tagħlim f'timijiet



- Laboratorji fi gruppi
- Xogħ ol individwali

### Għanijiet - Skopijiet

- L-istudenti jsiru konxji tas-sitwazzjoni tal-Baltiku u reġ juni tal-Mediterran.
- L-istudenti jiż viluppaw attitudnijiet u l-ħ iliet għ all-applikazzjoni tal-għarfien miksub permezz ta' tagħlim kollaborattiv, assenjazzjonijiet u approċ ċ i interdixxiplinarji.
- L-għalliema u l-istudenti jiddiskutu u jipproponu soluzzjonijiet għ all-preservazzjoni u jikkontribwixxi għ all-iżvilupp ulterjuri taż-żewġ reġjuni.

KORS X	ECTS	KONTENUT	METODI/ GħODDA
<b>Modulu 1</b>	3	Suġġett 1: Sinifikat u Bijodiversità	
<b>Modulu 2</b>	3	Suġġett 2: Problemi u toxics	
<b>Modulu 3</b>	3	Suġġett 3: Immaniġġjar tal-problemi u nevitaw it-tibdil fil-klima	
<b>Studju ta' Każ</b>	6	Toxics u skart tal-bniedem mill-bastimenti	





## KORS II

### MODULU 1 TEMPLATE: Sinifikat u Bijodiversità

Titlu	Deskrizzjoni
Livell	
Semestru	Harifa
ECTS	3
lingwa tat-tagħlim	Ingliz
Numru ta' lectures	
Numru ta' laboratorji	
Homework	Sinifikat għall-bnedmin u n-natura minn perspettivi differenti. Bijodiversità b'modi differenti.
Laqgħat / tutorja	
Għanijiet tal-kors	-Fehim ta' tifsiriet differenti ta' żoni tal-baħar għall-bniedem u għall-ambjent. -Familiarizzazzjoni ta' bijodiversitajiet differenti u l-komponenti tagħhom. -Aġġornament tal-modi differenti sabiex niproteġu l-bijodiversità.
Kontenut tal-kors	- Sinifikat ta' żoni ta' baħar fil-perspettivi differenti ta': l-industrija, it-trasport, l-attività tal-port, l-użu rikreattiv eċċ -Diskussjonijiet dwar is-sinifikat differenti għal nies fil-klassijiet ekonomiċi differenti - Il-bijodiversità u dak li jwassal għaliha: istorja fiżika, il-klima, l-età tas-silġ, l-attivitajiet umani eċċ - Speċi marini f'ibħra differenti - Protezzjoni tal-bijodiversità - Issues tal-bijodiversità u soluzzjonijiet proposti
Valutazzjoni	



## MODULU 2 : Problemi u toxics

Titlu	Deskrizzjoni
Livell	
Semestru	Harifa
ECTS	3
lingwa tat-tagħlim	Ingliz
Numru ta' lectures	
Numru ta' laboratorji	Studju fil-qasam prattiku u laboratorji
Homework	
Laqgħat / tutorja	
Għanijiet tal-kors	<ul style="list-style-type: none"><li>- Fehim ta' sorsi ewlenin ta' toxics</li><li>- Għarfien tal-problemi varji</li><li>- Riċerka dwar toxics minn kampjuni</li></ul>
Kontenut tal-kors	<ul style="list-style-type: none"><li>- Problemi f'żoni tal-baħar, liema huma l-kawżi ewlenin, eċċ</li><li>- minn fejn jiġu t-toxics: agrikoltura, fabbriki, industrija, trasport, drenaġġ u attivitajiet umani oħra, eċċ</li><li>- Ilma fil-wieċ u toxics</li><li>- Il-ħsara ta' toxics u komponenti oħra fuq in-natura</li><li>- ġbir ta' kampjuni</li><li>- Konċentrazzjoni u akkumulazzjoni ta' toxics fil-katina alimentari</li><li>- Tnaqqis ta' toxics</li></ul>
Valutazzjoni	Fieldwork u riċerka fuq toxics minn kampjuni Diskussjoni dwar soluzzjonijiet proposti għall-problemi ta' toxics



## MODULU 3: Immanigġjar tal-problemi u nevitaw it-tibdil fil-klima

Titlu	Deskrizzjoni
Livell	
Semestru	Rebbiegħa
ECTS	3
lingwa tat-tagħlim	Ingliz
Numru ta' lectures	
Numru ta' laboratorji	
Homework	
Laqgħat / tutorja	
Għanijiet tal-kors	<ul style="list-style-type: none"><li>- Fehim dwar kif l-immanigġjar tal-problemi jiddependi fuq il-kultura taż-żona u għaliex l-istess soluzzjonijiet ma jaħdmux fl-oqsma differenti</li><li>- L-għarfien Ewropej dwar it-tniġġis tal-ilma u t-tibdil fil-klima</li></ul>
Kontenut tal-kors	<ul style="list-style-type: none"><li>- Studju tal-istatus ekonomiku, politiku, soċjali u kulturali ta' żewġ reġjuni tal-baħar</li><li>- Informazzjoni u sensibilizzazzjoni għall-Ewropej kollha</li><li>-Tibdil fil-klima: x'qed jikkawżaha u kif din taffettwa r-reġjun tal-baħar</li><li>-Kif timpedixxi t-tidbidil fil-klima u wkoll tithejja għaliha</li></ul>
Valutazzjoni	



## MODULU 4: Toxics u skart tal-bniedem mill-bastimenti

Titlu	Deskrizzjoni
Livell	
Semestru	Rebbiegħa
ECTS	6
lingwa tat-tagħlim	Ingliz
Numru ta' lectures	
Numru ta' laboratorji	
Homework	Ripetizzjoni tas-suġġetti preċedenti.
Laqgħat / tutorja	Laqgħa tal-bidu , oħra fin-nofs punt u aktar skond in-neċessita
Għanijiet tal-kors	-Biex jitpoġġew fil-prattika s-suġġetti preċedenti kollha -Analiżi u applikazzjoni tat-tagħrif - Trasport bil-baħar, it-tipi ta' trasport differenti u l-attributi differenti
Kontenut tal-kors	xogħol ta' studju ta' kaz
Valutazzjoni	xogħol ta' studju ta' kaz

Handouts għall-istudenti dwar Kors 2

## **L-istat attwali u futuri taż-Żoni tal-Baltiku u l-Mediterran f'perspettiva interdixxiplinari**

### **MODULU 1: Sinifikat u Bijodiversità**

It-temi ewlenin f'dan il-modulu huma s-sinifikat u l-bijodiversità taż-żoni Mediterranji u tal-Baħar Baltiku. Wara dan il-modulu l-istudent ser jifhem it-tifsiriet differenti taż-żoni tal-baħar għall-bniedem u għall-ambjent. Il-modulu jipprovdi informazzjoni u pariri dwar biodiversitajiet differenti u d-differenzi bejniethom. Se jiġu introdotti wkoll l-modi varji biex jipprogettawhom.

F'dan il-modulu it-tagħlim huwa magħmul minn 12 lectures ta' 90 minuta, fejn l-aħħar 2 lectures jinkludu l-prezentazzjonijiet tal-istudenti.

Il-marki jkunu fuq skala minn 1 sa 5 fejn 5 hija l-aħjar marka. L-evalwazzjoni tal-kors jikkonsisti fil-kitba ta' essay, il-prezentazzjoni u l-attendenza għall-lectures, b'terz tal-grad f'kull kaz.

**Qed tiġi mitluba preżenza minima ta' 80% għall-lectures.**

**Homework 1:** Essay dwar is-sinifikat taż-żona tal-Mediterran jew il-Baħar Baltiku. L-essay għandu jeżamina l-importanza taż-żona tal-baħar minn perspettivi differenti.

Istruzzjonijiet għall-essay: 2000 kliem, spazjar 1.5, font Times New Roman

**Homework 2:** Prezentazzjoni ta' madwar 15-il minuta dwar il-bijodiversità ta' zona tal-baħar. Wara ssir diskussjoni mmexxija mill-istudenti. Din tista' wkoll issir fi gruppi. Is-sugġetti tal-prezentazzjonijiet tiġi deċiża ibbażata fuq l-interess individwali muri matul il-kors.

## **MODULU 2: Problemi u toxics**

It-temi ewlenin f'dan il-modulu huma l-problemi u t-toxics f'zoni tal-Mediterran u tal-Baħar Baltiku. Il-modulu jitratta s-sorsi ta' toxics u kif dawn jaffettwaw l-ambjent u n-natura. Jiġu introdotti wkoll il-konċentrazzjoni ta' toxics u l-akkumulazzjoni tagħhom fil-katina alimentari. Wara modulu 2 l-istudenti se jkunu jistgħu jiġbru kampjuni u jagħmlu r-riċerka dwarhom. L-istudenti se jkunu jistgħu jagħmlu r-riċerka, janalizzaw ir-riżultati u jeżaminaw ir-riżultati b'mod kritiku.

F'dan il-modulu it-tagħlim huwa magħmul minn 12-il lectures ta' 90 minuta u 12 laboratorji ta' 2h u xogħol fil-kamp prattiku.

### **Qed tiġi mitluba preżenza minima ta' 80% għall-lectures.**

Il-marki jkunu fuq skala minn 1 sa 5 fejn 5 hija l-aħjar marka. L-evalwazzjoni tal-kors jikkonsisti fil-kitba ta' djarju ta' studju u attendenza għall-lectures/laboratorji, b'żewġ terzi tal-grad għad-djarju u terz tal-grad għall-attendenza.

**Homework:** Djarju ta' studju dwar kif isir ir-riċerka. Id-djarju għandu jinkludi: nota wara kull lecture, laboratorju u xogħol fil-kamp prattiku, revizjoni tat-tagħlim personali, hsibijiet dwar il-proċess tat-tagħlim, riċerka pass pass, djarju tax-xogħol tal-laboratorju u l-argumenti kritiċi dwar ir-riċerka proprja.

### **MODULU 3: Immaniġġjar tal-problemi u nevitaw il-bidla fil-klima**

It-temi ewlenin f'dan il-modulu huma l-immaniġġjar tal-problemi u l-evalwazzjoni tat-tibdil fil-klima.

L-istudenti se jsiru konxji tas-sitwazzjoni taż-żoni tal-Mediterran u tal-Baħar Baltiku. Huma jiffamiljarizzaw ma' komponenti differenti li jikkawżaw stati differenti. L-istudenti ser jkunu ntrodotti għal soluzzjonijiet differenti u għaliex huwa importanti li tkun taf l-komponenti kulturali u ambjentali fil-qasam ta' studju. L-istudenti se jkunu jafu kif jipprezentaw u jargumentaw l-opinjonijiet tagħhom.

F'dan il-modulu it-tagħlim huwa magħmul minn 12-il lecture ta' 90 minuta u 6 sessjonijiet ta' diskussjoni ta' 90 minuta.

#### **Qed tiġi mitluba preżenza minima ta' 80% għall-lectures.**

Il-marki ser ikunu fuq skala ta' 1 sa 5 fejn 5 hija l-aħjar marka. L-evalwazzjoni tal-kors tikkonsisti f'diskussjoni, artikolu u attendenza għall-lectures, fejn kull parti għandha terz tal-grad totali.

**Homework 1:** Diskussjoni hija taħdita bejn żewġ perspettivi differenti. Il-parteciċipanti jippreparaw l-argumenti u l-kontro argumenti tagħhom. Huma wkoll jagħmlu reviżjoni tal-letteratura biex jappoġġjaw l-argumenti tagħhom.

**Homework 2:** Artikolu kritiku ta' 2000 kliem, spazjar 1.5, font Times New Roman. Artikolu bbażat fuq riċerki fejn l-argumenti jiġu mmaniġġjati b'mod kritiku.



#### **MODULU 4: Toxics u skart tal-bniedem mill-bastimenti.**

It-temi ewlenin f'dan il-modulu huma toxics u skart tal-bniedem mill-vapuri li huma eżaminati fil-gruppi ta' studju. Ir-riċerka ta' studju fuq il-każ isir fuq ir-reġjuni tal-Mediterran u tal-Baħar Baltiku. Dawn iż-żewġ reġjuni jiffaċċjaw għadd ta' problemi ambjentali. F'dan il-modulu dawn il-problemi se jkun definiti, studjati u jiġu proposti soluzzjonijiet.

Dan il-modulu jikkonsisti minn 12-il lecture ta' 90 minuta fejn se tiġi ntrodotta l-bażi teoretika u 6 laqgħa ta' 90 minuta fejn se jkunu ppreżentati r-riżultati.

#### **Qed tiġi mitluba preżenza minima ta' 80% għall-lectures.**

Il-marki ser ikunu fuq skala ta' 1 sa 5 fejn 5 hija l-aħjar marka. L-evalwazzjoni tal-kors hija bbażat fuq ir-riċerka ta' studju. Il- ħidma tal-istudju huwa bbażat fuq il-Baltic Sea Action Plan (BCAP).

# Sinifikat u Bijodiversità Significance and Biodiversity

Modulu 1 minn kors II: Is-sitwazzjoni attwali u futura taż-Żona Baltiku u l-Mediterran  
f'perspettiva interdixxiplinari

Module 1 from course II: Current state and future of the Baltic and Mediterranean Area in  
an interdisciplinary perspective

Katerina Plakitsi, Triantafyllos A. Albanis & Athina C. Kornelaki University of Ioannina / Università ta' Ioannina

Noora Kivikko University of Helsinki / Università ta' Helsinki



# Contents

- Course objects
- The Mediterranean Sea
  - Location, features, characteristics
- The Baltic Sea
  - Location, features, characteristics
- Significance
  - The Mediterranean Sea
  - The Baltic Sea
- Biodiversity
  - The Baltic Sea
  - The Mediterranean Sea

The teaching language at the University of Malta is English and therefore the course content is being presented in the English language to be used by any Maltese students/learners.

Il-lingwa tat-tagħlim fl-Università ta' Malta hija l-Ingliż u għalhekk il-kontenut tal-kors qed jiġi ppreżentat bil-lingwa Ingliża għal-użu tal-istudenti Maltin.



# Course objects

- Understanding of many various significances of Baltic and Mediterranean Sea areas to humans and environment
- Familiarize different biodiversities, dimensions of biodiversity and which components causes the differences
- Special features of both Sea areas
- Understanding and reviewing of many ways to protect biodiversity



# The Mediterranean Sea

## Overview

- Sea is surrounded by the Mediterranean region between Southern Europe and Anatolia, on the south by North Africa and on the east by Levant
- Surface area 2 500 000km<sup>2</sup> ,volume 3 750 000km<sup>3</sup>
- Average depth 1,5km, max depth 5,3km
- The Mediterranean-rim countries hold around 400 million people, and 135 million of them live on the coast, basin countries about 60



# The Mediterranean Sea

## Overview

- Connected to the Atlantic Ocean by the Strait of Gibraltar, by Suez Canal connected to the Red Sea
- 5000 islands (marine biodiversity hotspot)
- Mediterranean climate characterizes basin, cool wet winters, hot long summers
- Salinity at 5m depth is 3,8%
- Annual rainfall 50mm (Libya, Egypt)- 1000mm (Balkan)
- Evaporation is high in eastern half



# The Mediterranean Sea

## History

- Geological history: involved in the tectonic break-up and then collision of the Africa and Eurasian plates, dried seasons (12-5 mil. years ago), several different stages
- Biological history: old flora and fauna, lot of endemic species, species from Atlantic and Red Sea
- Human history:
  - Situated at the crossroads of Africa, Europe, and Asia, the Mediterranean coasts have witnessed the flourishing and decline of many civilizations
  - Migration towards coastal areas, south and east of the Mediterranean

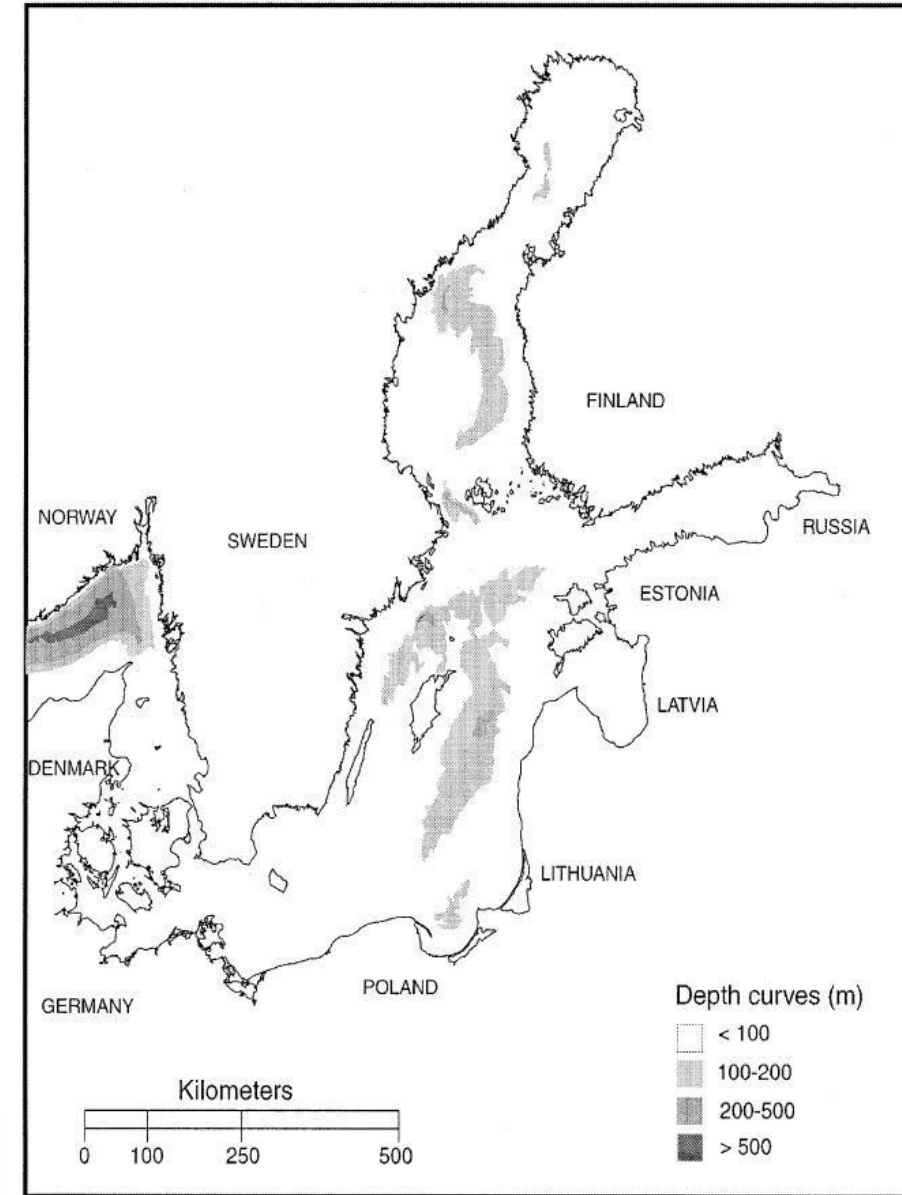




# The Baltic Sea

## Overview

- The Baltic Sea lies between 53° N and 66° N latitude and 10° E and 66° E longitude
- Area 422,000 km<sup>2</sup>
- Volume is about 20,000 km<sup>3</sup>
- Shallow sea, mean depth 54m, max depth 459m
- Semi-enclosed
- Ice cover
- Brackish water- a mixture of fresh water and saline seawater
  - Salinity 0,6 % (one fifth of the salinity of the oceans)
  - Water remains within the sea for up to 30 years
- Drainage area 4 times larger than the sea region
  - 85 mill. people



# The Baltic Sea

## Measurements

- The stratification by salinity and temperature levels
  - Halocline is situated at ca. -50- 80m
  - Thermocline is situated at ca. -30m
- The salinity of the surface waters varies between 1‰-8‰
- The deep waters of central Baltic have salinity of 15-20‰
- Hypoxia in bottom water
  - Oxygen concentrations less than 2mg/l
  - Caused by excess nutrient loading and decompose of sinking death algal blooms
- Other measurements: phosphory, nitrogen, pH, alkalinity, hydrogen sulphine etc.
- Saline pulses

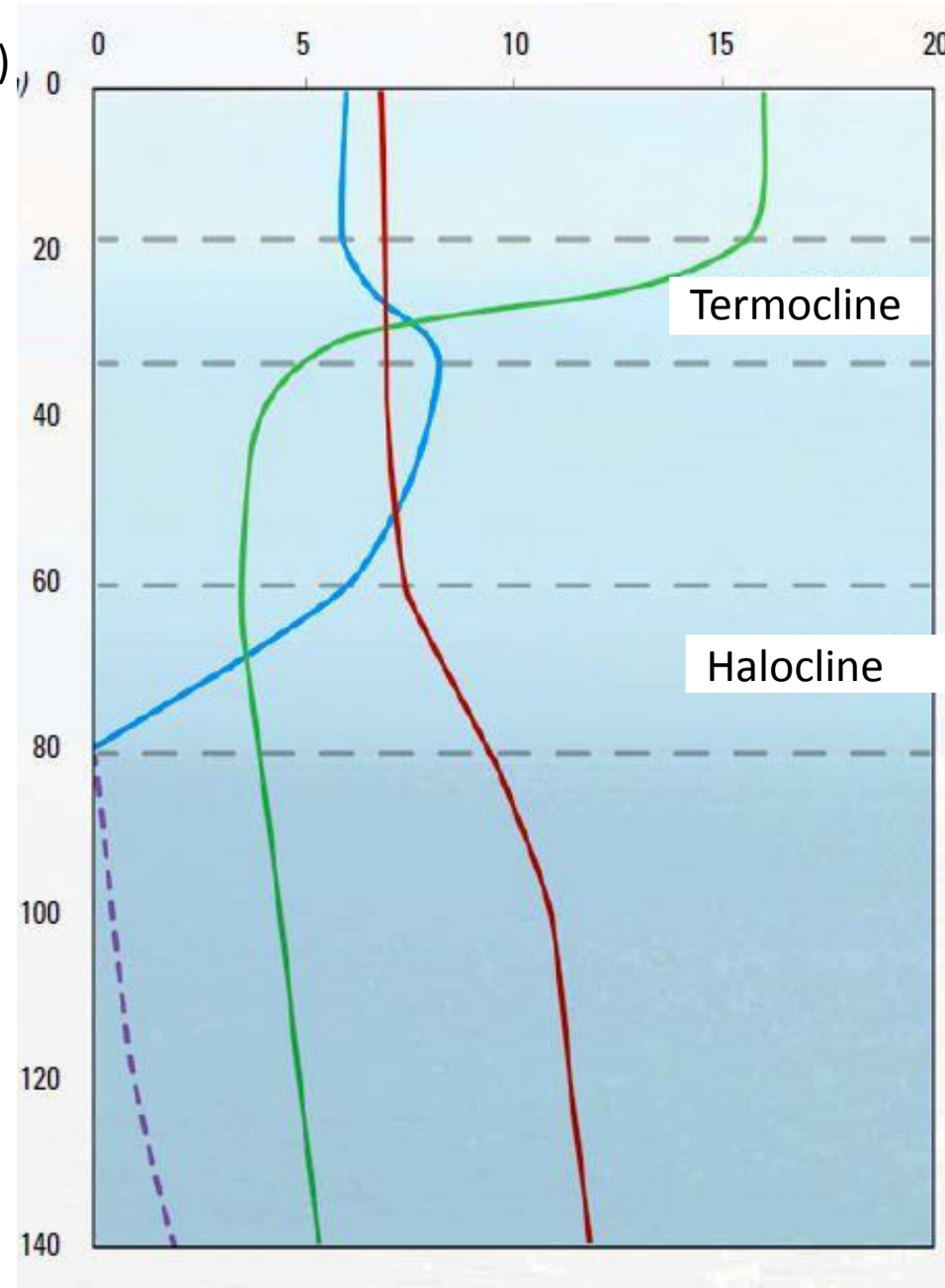


# The Baltic Sea

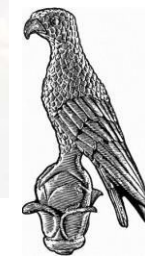
## Measurements



Depth (m)



Gotland Basin  
August



# The Baltic Sea

## Measurements

- From 1892 regular measurements of hydrographic parameters have been carried out
  - Salinity is at the same level as at the beginning of century, maximum 1950s, minimum 1992-1993.
  - Temperature trend shows a clear rise
  - Oxygen trend is clearly negative
  - Nutrition levels varied
- The Baltic Sea has problems with nutrient overload (eutrophication)

# The Baltic Sea

## History

- Young sea, current form 3000 years
- Have developed to current form after last Ice Age.
  - Earlier stages: Baltic Ice Lake, Yoldia Sea and Ancylus Lake
  - Connection to the Atlantic opened 8000 years ago
- Different water levels and saline conditions
  - Sediments and fossil records
- Basement of the Sea is variable and archipelago is scattered (continental ice, water flows etc.)
  - Variable habitats



# Significance of Sea

- Significance of the Mediterranean and Baltic Sea areas can be divided into two parts i) significance to humans and ii) to nature and environment
- Inside these two sections can be found several different perspectives
- Because of various different significances of the Mediterranean and Baltic Sea areas there is no simple solutions of problems of those Sea areas



# Significance for humans

## The Mediterranean Sea

- History of the Mediterranean region
  - Development of many modern societies
    - Phoenicians, Roman Empire, Ancient Egypt, Arab Empire, Ottoman
- Route
  - Merchants and travellers
  - Trade
  - Cultural exchange
- Source of food
- Leisure





# Significance for nature

## The Mediterranean Sea

- Marine biodiversity hotspot region, 17 000 species
  - 7,5% of all marine species
- Second most important area to endemic species after tropic regions
  - Endemic species: nesting sea birds 90%, sea squirts 50% and sponges 46% of all species
- Several different habitats
  - Coral reefs

# Significance for humans

## The Baltic Sea

- Humans have advantage of resources of the Baltic Sea for thousands of years- long history of human activities
  - Frisian 6th century, first marine trade routes and ports
  - Hanseatic League, 14th to 17th-century trade group
  - Archeology
  - Understanding of the past
- Strategically important area for surrounded countries
- The second busiest sea region after English channel
  - 80% of foreign trade of Finland is transported by the Baltic Sea



# Significance for humans

## The Baltic Sea

- Energy
  - Source of energy and way for transport it (windmills, Nord-Stream)
- Transport
  - Industry, raw materials, energy, labor, foreign trade
- Trade
  - Aqua activities, tourism, market products
  - 50% of tourists and immigrants of Finland are from surrounding countries of the Baltic Sea



# Significance for humans

## The Baltic Sea

- Leisure
  - Cruises
  - Housing
  - Beach activities, fishing etc.

”The most popular recreation activities in the Baltic Sea is hanging around on the beach and fishing. There is differences between the countries around the Baltic Sea”

([http://www.centrumbalticum.org/sites/default/files/raportit/ahtiainen\\_heini\\_ja\\_artell\\_janne\\_final.pdf](http://www.centrumbalticum.org/sites/default/files/raportit/ahtiainen_heini_ja_artell_janne_final.pdf))

# Significance for nature

## The Baltic Sea

- Significance for nature
  - Water quality
  - Biodiversity, habitats, fauna, flora
  - Nesting region
  - Endangered species

# Biodiversity

- Biodiversity is the variety of life. The term is used to describe the variety of life found on Earth and all of the natural processes. It includes ecosystem, genetic and cultural diversity and the connections between these and all species. Coined by Edward O. Wilson in the 1980s.
- How to value biodiversity?
  - Normally valuation happens with species which are easy to calculate (mammals, birds, vascular plants). Depiction of totality of biodiversity distorts. Example microbes.



# Biodiversity

- Favourable conservation status of biodiversity
  - Natural landscapes and seascapes
  - Thriving and balanced communities of plants and animals
  - Natural species diversity
  - Viable populations of species

(HELCOM)



# Biodiversity

## Protection

- Protected area over 1,1 million square kilometres (EU)
- In the EU, only 17% of habitats and species and 11% of ecosystems protected under EU legislation are in a favourable state
- Several protection programmes: Biodiversity strategy for 2020 (EU), Natura 2000
- Around 30% of the linear coastline in Mediterranean is under some form of protection (1200000 hectares)
- The system of marine protected areas covers 0,4% of the Mediterranean Sea surface
- BSAP (the Baltic Sea Action Plan)
  - One of main goals of the plan is to achieve a favourable conservation status of Baltic Sea biodiversity
- Red list of Baltic Sea species, biotopes, habitats in danger of becoming extinct
  - The harbour seal (*Phocoena phocoena*), the Baltic ringed seal (*Phoca hispida botnica*), Eurasian otter (*Lutra lutra*), the Kentish plover (*Charadrius alexandrinus*), the eel (*Anguilla anguilla*) etc.
- Blue Plan



# Biodiversity

## Researches

- Themes of biodiversity researches: How benthic communities handle external interferences and recover from it? Non-native animals, interesting perspective for ecological research. Biodiversity technologies. Spatial and temporal patterns of species diversity. Undescribed species.

# Biodiversity of the Mediterranean Sea

## Overview

- High amount of marine species- 17 000
- Islands- high value to global biodiversity due to their wealth of species
- Endemism
- Species inhabiting coastal sand dune systems are vulnerable
- Undescribed species- deep-sea areas, south and east regions
- Biodiversity generally higher in coastal areas and continental shelves, and decreases with depth

# Important habitats that support biodiversity

- **rocky reefs**

- Endangered Mediterranean monk seal (*Monachus monachus*) as well as several endemic fish and invertebrates

- **seagrass meadows**

- breeding, feeding, and resting areas for numerous marine species, particularly fish, crustaceans, and marine turtles

- **upwelling areas**

- Ligurian Sea, most important in the Mediterranean

# Local Species

19 species of cetaceans can be encountered

- 8 of them are considered common

**Fin Whale** *Balaenoptera physalus*, **Sperm Whale** *Physeter macrocephalus*, **Striped dolphin** *Stenella coeruleoalba*, **Risso's dolphin** *Grampus griseus*, **long finned Pilot whale** *Globicephala melas*, **Bottlenose dolphin** *Tursiops truncatus*, **Common dolphin** *Delphinus delphis*, **Cuvier's beaked whale** *Ziphius cavirostris*

- 4 are occasional and

**Minke Whale** *Balaenoptera acutorostrata*, **Killer whale** *Orcinus orca*, **False Killer whale** *Pseudorca crassidens*, **Rough toothed dolphin** *Steno bredanensis*

- 6 accidental, alien to the Mediterranean, but occasionally sighted in the last 120 years

among them the **Humpback whale** *Megaptera novaeangliae*



# Characteristic species

- Endangered **Mediterranean monk seal** (*Monachus monachus*),
- **Mediterranean mussel** (*Mytilus galloprovincialis*),
- **Mullet** (*Mugilidae spp.*),
- **Gilthead sea bream** (*Sparus auratus*),
- **Sea bass** (*Dicentrarchus labrax*), and
- The **Greater flamingo** (*Phoenicopterus ruber*)

Also found in this ecosystem are:

- **loggerhead sea turtles** (*Caretta caretta*),
- **green sea turtles** (*Chelonia mydas*), and
- **leatherback sea turtles** (*Dermochelys coriacea*)



# Biodiversity of the Mediterranean Sea

## Risks

- Grow of population, migration
- Tourism – 200 million visitors per year
- Overexploitation and habitat loss
- Pollution
- Non-native species
- Climate change



# Impacts of Climate Change in biodiversity

## Mediterranean Sea

- Extreme events (Storms, gales, floods, thermal anomalies)
  - Massive habitat destruction
  - Scarce endemic species mortality
  - Stress induced epidemics
- Sea level rise
- Temperature increase → Migration Migration towards the North
  - Marine turtles:
    - Prompt nidification and short laying intervals
    - Low clutch success
    - Changes in distribution and abundance of the species
    - Migration routes modifications
    - Reduction of breeding beaches

# Impacts of Climate Change in biodiversity

## Mediterranean Sea

- Sesile invertebrates:
  - Risks of local populations extinction, loss of genetical diversity
- Fishes:
  - Physiological modifications and effects on reproduction
  - Migration alterations
  - Effects on growth rates and population dynamics
- Alien species:
  - Boosting of colonization and expansion towards the North
  - New arrived toxic phytoplankton species
- Birds:
  - Phenological changes (included migration)
  - Changes in distribution and geographical range
  - Impact on demographical parameters (performance of reproduction, eggs' size, laying dates, breeding success...)



# Threatened coastal and marine habitats

Mediterranean Sea

- **Wetlands** (submersion by sea-level rise)
- **Sea grass beds** (changing sediment flux)
- **Coraligenous calcareous formations** (lack of opportunity for northwards migration after temperature increase)
- **Pelagic waters planktonic fringes** (Sea acidification by CO<sub>2</sub>, altered nutrients load and water transparency)

# Threatened coastal and marine species

Mediterranean Sea

- **Isolated populations**

- Closed sea
- Not a migration pathway
- Most affected habitats of the coolest aérias

- **New warmer-waters species**

- Extinction of local populations
- Disease transmission
- Direct predation

- **High species biodiversity vs. Low population numbers → High niche specialization =>**

- extinction vortex and
- possibly limited resilience to climatic change



# Other risks

## Mediterranean Sea

- Shipping noise
- Marine vessels on benthic habitats and species
- Shipping – derived antifouling biocides
- Collisions with marine mammals and turtles
- Ship-generated oil discharges and exhaust emissions



# Biodiversity of The Baltic Sea

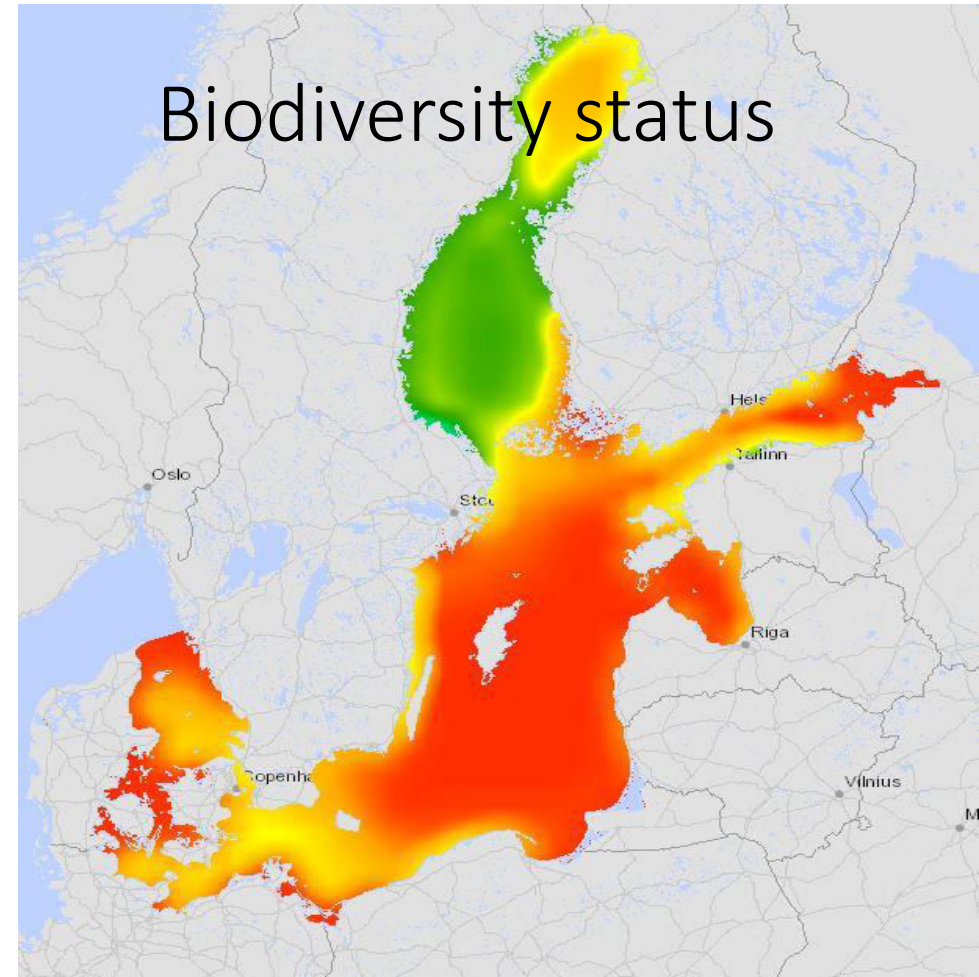
## Overview

- An estimates 150 habitats, 100 species of fish, 450 species of macroalgae, 1000 zoobenthos species, 3000 plankton species and thousands of unknown species of viruses and bacteria
- The largest backish water basin in the world: species from marine, brackish and freshwater.
  - Main ecological barrier is salinity factor (Atlantic)
  - Water exchange is very limited

# Biodiversity of The Baltic Sea

## Overview

- Lot of different habitats and ecosystems
- Archipelago is scattered (ice age) and seabed is multiform
- Multiform environment (openness, soil ingredients, altitude differences) and variable conditions (salinity, brightness, nutrient content) offers several different habitats and ecological niches
- Increasing variety of habitats → More species
- Biodiversity status varies due several different components
- Species composition changes due salinity



<http://maps.helcom.fi/website/SeaEnvironmentalMonitoring/index.html>



# Biodiversity of The Baltic Sea

## Ecosystems

- Offing ecosystem
  - Plankton, upwelling, sedimentations, grazing chain
- The coastal ecosystems
  - Hard seabed habitats
    - Algae communities
    - Mussel communities
  - Soft seabed habitats
    - Benthic communities
- Multiform seabed structure has strong significance to habitats
- Hypoxic waters

# Biodiversity of The Baltic Sea

## Fauna and flora

- Fauna and flora consist of saline and fresh water species
  - Limited number of species (60 evident species)
  - Organisms origin from seas or lakes
  - Current species can handle low salinity/brackish water
  - Fossil records show an alternating dominance by typical freshwater and marine species since the last glaciation period
- In the most common salinity level the number of species is low
- During of it's history the fauna and flora have been subject to major environmental changes several times.
  - Fossils & present flora/fauna



# Biodiversity of The Baltic Sea

## Benthos and invertebrates

- Benthos and invertebrates- decreases from south to north, ability to tolerates fresh water
- Problematic oxygen situtation causes changes in benthic community- changes to ecosystem
- Lot of undescribed species

# Biodiversity of The Baltic Sea

## Algae and vascular plants

- Low rocks: colourfull algae
- Upper rocks: green and brown annual algae
- Deeper rocks: bigger perennial algae
- On the rocks: sheeting algae
- Deeper solid rocks: polyp colonials and mussels
- Bright sand beds: rooted vascular plants

# Biodiversity of The Baltic Sea

Birds, fishes and mammals

- Birds
  - Lot of different species, nesting regions, archipelago.
- Fishes
  - Composition varies due salinity, salt pulses has positive effect, spawning rivers
- Mammals
  - 4 species: 3 seals and 1 whale (*Phocoena phocoena*)

# Biodiversity of The Baltic Sea

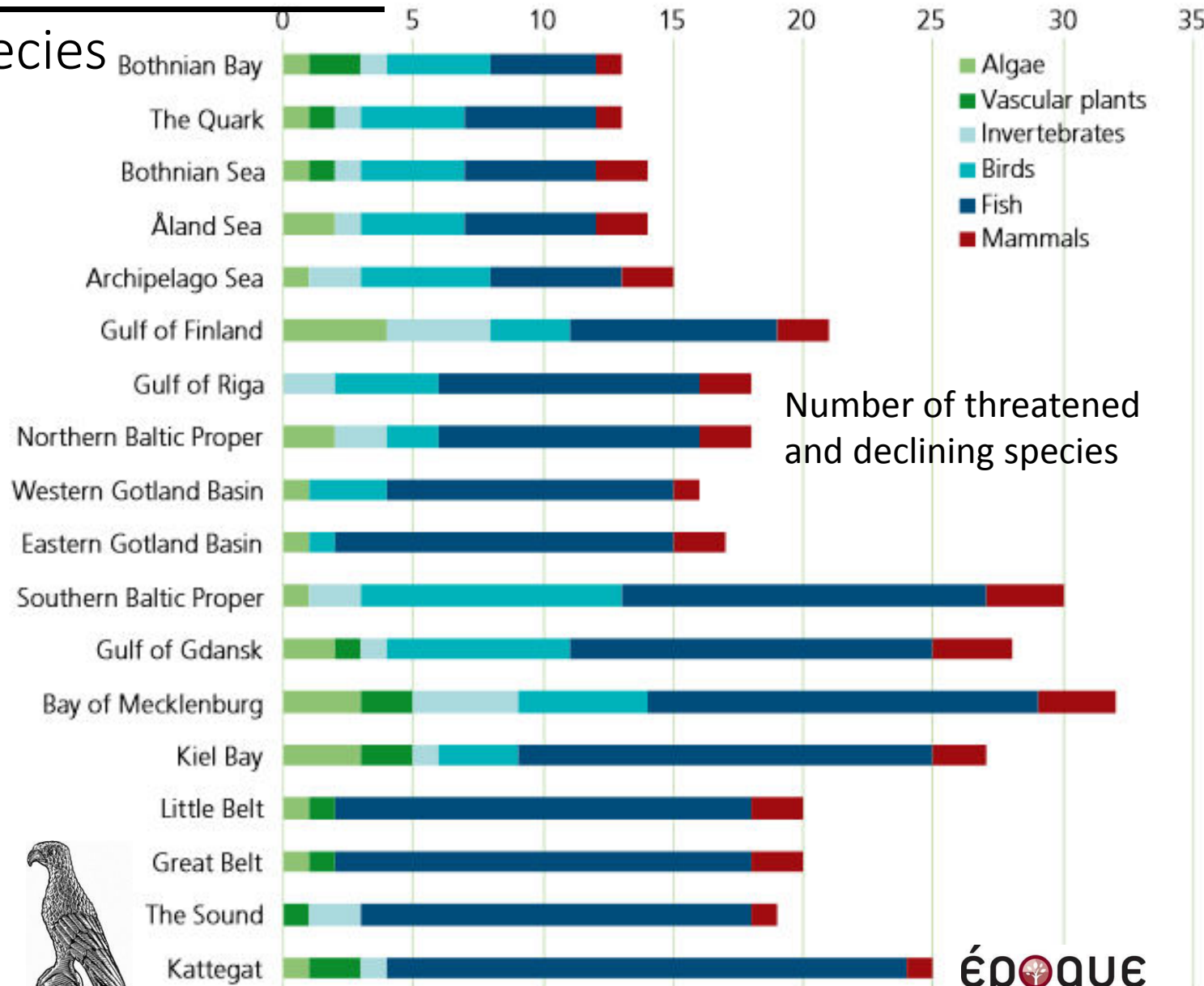
## New species

- New species are founded
  - Immigration
  - DNA research
    - Prokaryotic and eukaryotic cells, other microbes
  - Non-native animals

# Biodiversity of The Baltic Sea

## Threatened and declined species

- During the past one hundred years, the system has undergone decadal variations in salinity, oxygen and temperature
- Changes in hydrography have been linked to changes in the abundance and distribution of pelagic and littoral species and communities
- Ecosystem is sensitive- small changes in flora/fauna could have massive consequences in whole ecosystem





# Biodiversity of The Baltic Sea

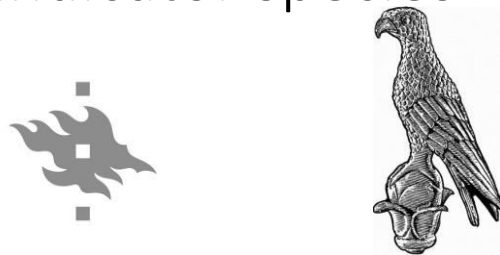
## Threatened and declined species

What causes the declining?

- Human activities have changed the sea environment in many ways: nutrients, hazardous substances, physical loss and damage, pollution, contamination, biological disturbance etc.
- Non-native species displaces
- Climate change impacts on environmental variables

Indicator species

- Biodiversity core indicator species
  - Assessing



# Biodiversity of The Baltic Sea

## Non-native species

- Non-native species have significantly altered ecosystems of the SE Baltic coastal lagoons, while their role in the northern coastal waters still is much less important.
- From Atlantic, other neighbouring water bodies by rivers and canals
- Growing problem
- In species-poor native communities non-native animal species manifest their ability of modifying their novel habitats
  - Increase of: physical and functional diversity, benthic-pelagic linkages
- *Teredo Navalis*, shipwrecks



# Assessments

- Essay about significance of sea area 1/3 grade
- Presentation about biodiversity 1/3 grade
- Presence at lectures 1/3 grade

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# Problemi u toxics

# Problems and toxics

**Modulu 2 minn kors II: Is-sitwazzjoni attwali u futura taż-Żona Baltiku u l-Mediterran  
f'perspettiva interdixxiplinari**

Module 2 from course II: Current state and future of the Baltic and Mediterranean Area in an interdisciplinary perspective.

Katerina Plakitsi, Triantafyllos A. Albanis & Athina C. Kornelaki University of Ioannina / Università ta' Ioannina  
Noora Kivikko University of Helsinki / Università ta' Helsinki



# Contents

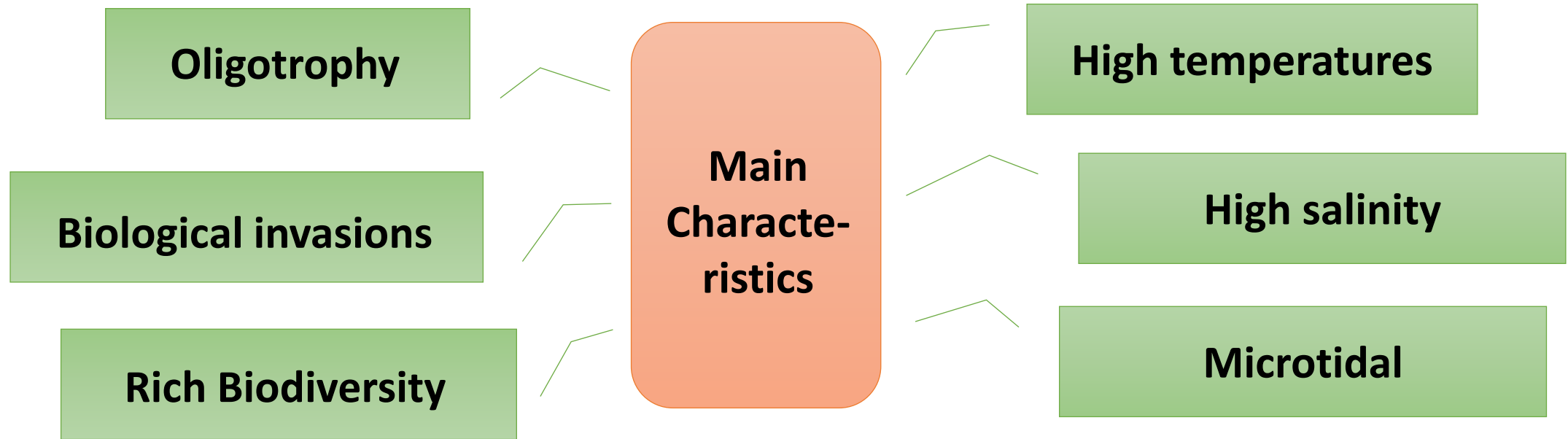
- The Mediterranean Sea
  - The special features
  - Problems
  - Toxics
- The Baltic Sea
  - The special features
  - Problems
  - Toxics
- Doing research

The teaching language at the University of Malta is English and therefore the course content is being presented in the English language to be used by any Maltese students/learners.

Il-lingwa tat-tagħlim fl-Università ta' Malta hija l-Ingliż u għalhekk il-kontenut tal-kors qed jiġi ppreżentat bil-lingwa Ingliża għal-użu tal-istudenti Maltin.

# The special features of the Mediterranean Sea

## Overview



# The special features of the Mediterranean Sea

## Overview

- Deep, elongated, and almost landlocked irregular depression lying between latitudes 30° and 46° N and longitudes 5°50' W and 36° E
- Stretches
  - from the Atlantic Ocean on the west
  - to Asia on the east and
  - separates Europe from Africa



[Encyclopædia Britannica, Inc.]

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# The special features of the Mediterranean Sea

## Connections

- Connected with
  - the **Atlantic Ocean** by the narrow and shallow channel of the Strait of Gibraltar
    - narrowest point roughly 13 km
    - the depth of the sill is about 320 m
  - the **Black Sea** through the Dardanelles
    - Northeast
    - sill depth of 70 m
  - the **Sea of Marmara**
  - the **strait of the Bosphorus**
    - sill depth of about 90 m
  - the **Red Sea** by the Suez Canal
    - southeast



# The special features of the Mediterranean Sea

## Basins

### Natural divisions

- Mediterranean Sea is divided into **western** and **eastern** parts by a submarine ridge between the island of Sicily and the African coast with a sill depth of about 365 m
- **Western** part (western basin) is subdivided into three principal submarine basins:
  - Alborán Basin is east of Gibraltar, between the coasts of Spain and Morocco
  - Algerian Basin, east of the Alborán Basin, is west of Sardinia and Corsica, extending from off the coast of Algeria to off the coast of France
    - Tyrrhenian Basin, that part of the Mediterranean known as the Tyrrhenian Sea, lies between Italy and the islands of Sardinia and Corsica



# The special features of the Mediterranean Sea

## Basins

### Natural divisions

- **Eastern** part is subdivided into two major basins:
  - Ionian Basin, in the area known as the Ionian Sea, lies to the south of Italy and Greece, where the deepest sounding in the Mediterranean, about 4,9 Km
- A submarine ridge between the western end of Crete and Cyrenaica (Libya) separates the Ionian Basin from the Levantine Basin to the south of Anatolia (Turkey)
- The island of Crete separates the Levantine Basin from the Aegean Sea, which comprises that part of the Mediterranean Sea north of Crete and bounded on the west and north by the coast of Greece and on the east by the coast of Turkey





# The special features of the Mediterranean Sea



## Mediterranean Basins

The different basins and its main wind and fluvial patterns.





# Problems of the Mediterranean Sea

## Habitat destruction and physical alteration

- shoreline construction and alteration
- wetland and salt-marsh alteration
- marine waters and coastal watershed alteration

# Problems of the Mediterranean Sea

## Emerging issues threatening ecosystems

- biological invasions
- overexploitation of fisheries resources
- expansion of aquaculture
- increasing appearance of Harmful Algal Blooms (HABs)

# Problems of the Mediterranean Sea

## Overexploitation of fisheries resources

- More than 90 species of marine fishes in Europe's waters are threatened with extinction (IUCN).
- *“Overfishing is not the only one problem in the Mediterranean. Illegal fishing activities and overcapacity, among others, are shortcomings that must be addressed with the appropriate enforcement of existing legislation. Moreover, fishing policy should be compatible with the implementation of measures responding to conservation-related EU legislation such as the designation and management of Natura 2000 sites at-sea”, added Pastor.*

# Problems of the Mediterranean Sea

## Harmful Algal Blooms (HABs)

### Different types of algal bloom:

- toxic blooms that discolour the water,
- blooms of non toxic species that harmlessly discolour the water or
- toxic blooms without causing discoloured waters.

### Become dangerous when:

- present at certain densities (few hundreds per litre) and
- concentrated by filter feeders (such as the common mussel) that are subsequently ingested by humans.

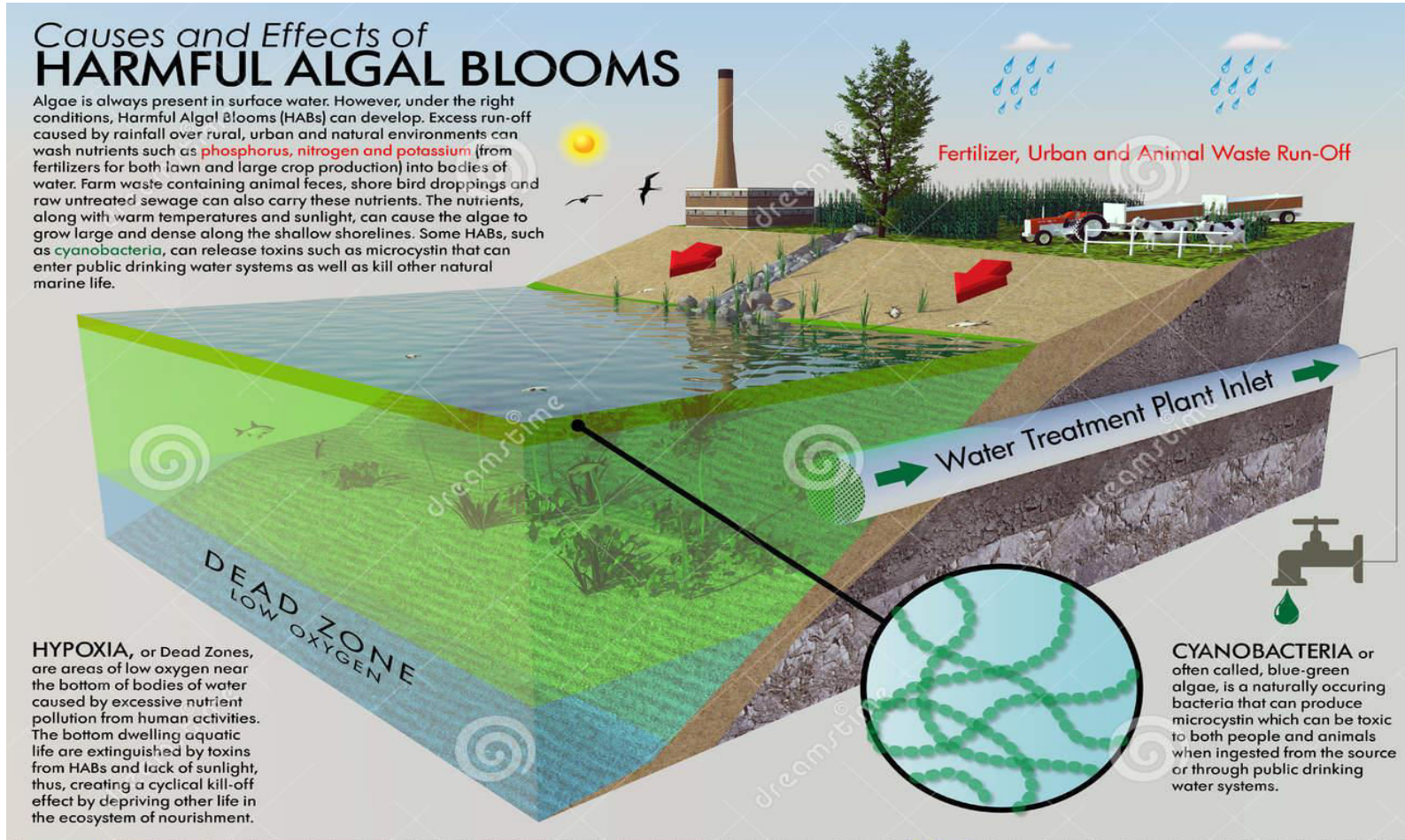


Team HABs <http://www.teamhabs.info/habs.html>



# Problems of the Mediterranean Sea

## Harmful Algal Blooms (HABs)



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# Problems of the Mediterranean Sea

## Harmful Algal Blooms (HABs)

- Highest toxicity in mussels
- followed by other shellfish such as the Pecten, and
- practically negligible in oysters.
- 52 species dinoflagellates, endemic of the Mediterranean have been identified which are able to produce Diarrhetic Shellfish Poisoning
  - Eight species in the whole Adriatic
- Only DSP toxicity cases have been reported in the Mediterranean





# Problems of the Mediterranean Sea

## Harmful Algal Blooms (HABs)





# Problems of the Mediterranean Sea

## Other Problems

- Eutrophication
- Pollution
- Tourism
- Shipping
- Climate Change

# Problems of the Mediterranean Sea

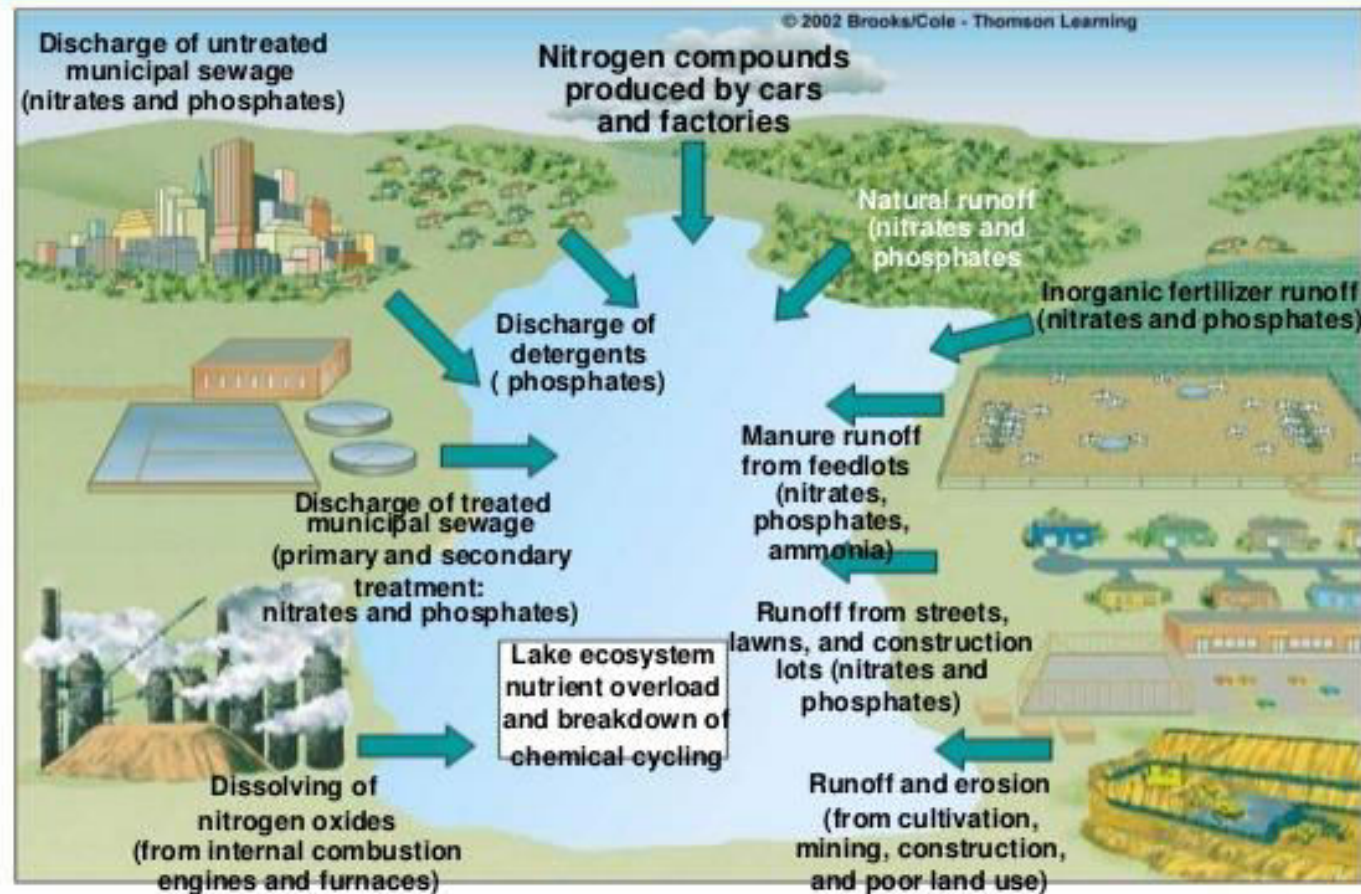
## Land-based sources of pollution

- sewage and urban run-off
- urban solid wastes
- persistent organic pollutants (POPs)
- heavy metals
- organohalogen compounds
- radioactive substances
- nutrients
- suspended solids
- hazardous wastes

# Problems of the Mediterranean Sea

## Eutrophication

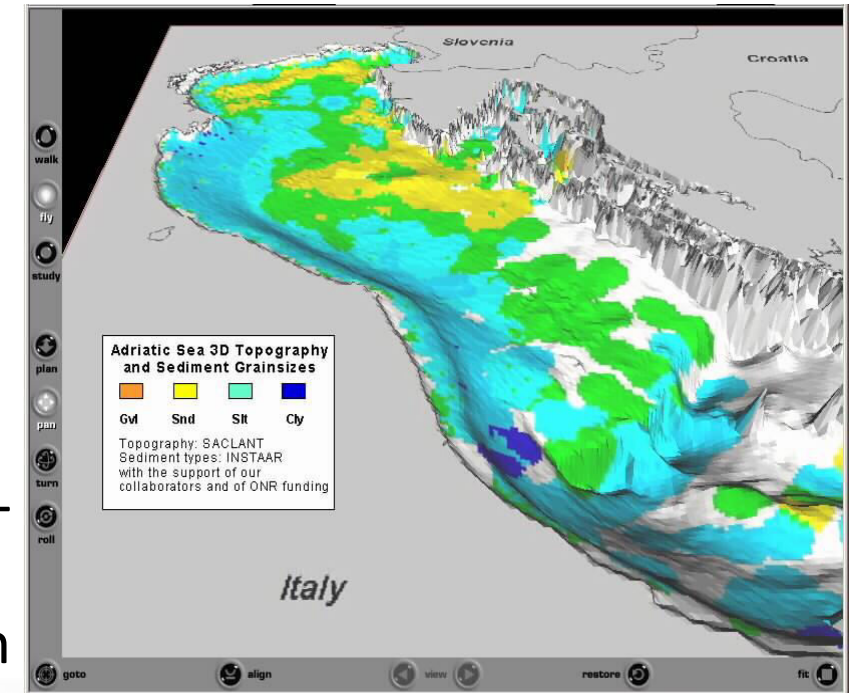
### Sources of Eutrophication



# Problems of the Mediterranean Sea

## Eutrofication

- The most endangered area is **Adriatic Sea**
  - surface about 132,000 km<sup>2</sup>, corresponding to 1=20 of the entire surface of the Mediterranean, but equivalent to 1=125 of its volume.
  - receives a large freshwater → highly susceptible to eutrophication.
  - Phytoplankton in the Adriatic is composed of various taxa
  - 150–200 species, largely dominated by Diatoms and Dinoflagellates have been identified so far.
  - Phytoplankton density ranges from 1000 to 600,000–700,000 cells per lit., depending upon location
  - in eutrophicated areas bloom cell densities can reach hundreds of millions per lit.





# Problems of the Mediterranean Sea

## Eutrofication

- **French coast**

- The French coast is mostly affected by the Rhone river discharge that delivers five million tons of suspended solids, 76,000 tons of inorganic N and 8400 tons of P per year.
- Blooms of diatoms and dinoflagellates occur in favourable conditions (low hydrodynamism, high temperatures, high stratification).
- The problem does not affect the French and Italian Riviera due to the cyclonic circulation from the Ligurian Sea.



# Problems of the Mediterranean Sea

## Eutrofication

- **Spanish coast**

- The Spanish coast is characterized by both natural enrichment due to upwelling and an induced eutrophication caused by human discharge.
- The high productivity of the Alboran Sea appears to be related to the upwelling generated by the anticyclonic circulation generated by the flow of Atlantic waters entering the Mediterranean through the Gibraltar strait.
- Highly eutrophicated areas appear to be coastal areas close to Valencia and the Ebre delta



# Problems of the Mediterranean Sea

## Eutrofication

- **Eastern Mediterranean**

- The Eastern Mediterranean is generally characterised by highly oligotrophic conditions.
- Coastal Greek waters, especially in bays and estuaries appear rather endangered. Algal blooms have been described in the Gulf of Salonikos, and Thessaloniki.
- The same applies to the Lebanon coasts, while in Egypt eutrophication has been largely observed in coastal waters as a result of the large nutrient input (though the Nile input was reduced by 90% in the last decades), such as in Alexandria and in some places nitrogen limitation and hydrogen sulphide production is observed.



# Problems of the Mediterranean Sea

## Mass tourism impact

- Land and landscape
  - Construction causes the greatest negative impact to the fragile coastal and marine ecosystems
  - Loss of biodiversity and landscape attractiveness
- Species
  - Over 500 plant species threatened with extinction and are under intense pressure from tourism development in some overbuilt destinations.
  - In Zakynthos (Greece), sea turtles have had their coastal nesting grounds disturbed and destroyed by tourism development and tourist behaviour
  - Impact on monk seal is devastating due to the loss of habitat

# Problems of the Mediterranean Sea

## Mass tourism impact

- Freshwater
  - During the summer months water supplies are exacerbated by tourist flows for use in hotels, swimming pools and golf courses.
  - This number increases to 880 lit. if the tourist uses accommodations with swimming pools and golf courses.
- Pollution and wastes
  - receives 10 billion tones of industrial and urban waste per year with little or no purification.
  - The production of wastewater and solid waste in tourist areas often exceeds the carrying capacity of local infrastructures due the high seasonal demand.
  - Pollution also negatively affects water quality in beach areas and drinking water supplies.

# Problems of the Mediterranean Sea

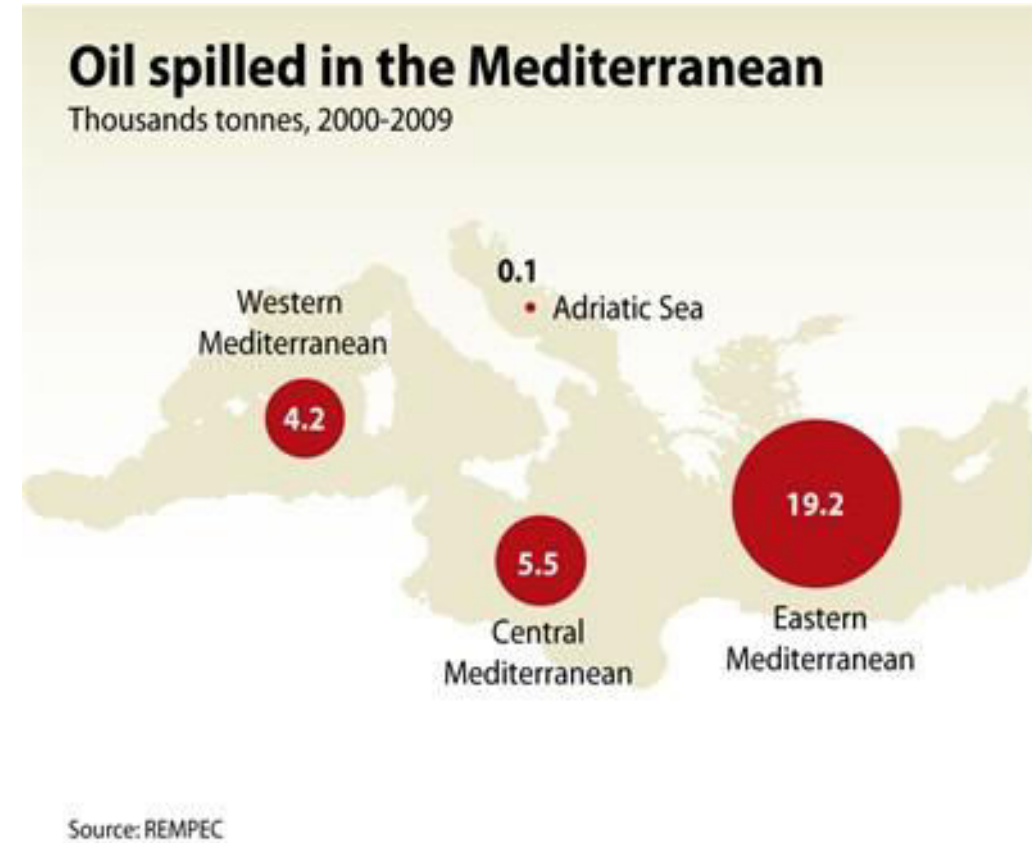
## Shipping

- Some of the world's busiest shipping routes in the Mediterranean
- Hazardous cargo carry
- Discharge of chemical tank washings and oily wastes
- Accidental oil spills

# Toxics of the Mediterranean Sea

## Oil/ Main effects

- reduction in oxygen levels
- changes in sediment properties (including changes in RPD-Redox Potential Discontinuity-layer depths)
- sediment hypoxia or anoxia are present only temporarily in areas very close to the oil spills
- reduction of the redox-potentials in sediments contaminated by oil have been observed with concentrations above 1000 ppm
- oil emulsion and tar particles may affect sediment structure and related sediment characteristics



# Toxics of the Mediterranean Sea

## Oil/ Main effects

- Oil toxicity is affected by:
  - its composition ( percentages of saturates, n-alkanes aromatics and insoluble)
  - the use of dispersants (such as organic solvents: phenol, propane, furfurole; and other substances contained in standard decontaminants such as Prodesolv 128=D, Albisol BPS, TC6)
- Under normal conditions, oil is removed by physical forces (tidal movements, evaporation, dispersion adsorption on particles, photo-degradation) that rapidly reduce hydrocarbon concentrations
- However, a large fraction of the oil might be buried in the sediments where microbial degradation plays an important role, unless oil reaches the deeper anaerobic layers, thus remaining un-degraded for years

# Toxics of the Mediterranean Sea

## Heavy metals

- Egypt coastal waters one of the most polluted areas:
  - About 5 to 14 tons of Hg are discharged annually to the coastal waters.
  - Hg and Pb are accumulated in organisms from regions affected by chlor-alkali, textile and dyes industries.
  - These metals are toxic causing several adverse effects on the mussel *Mytilus edulis*
- Similarly high heavy metal concentrations have been reported from Greek coasts (especially Saronikos Gulf and Elefsis Bay)
  - Cd concentrations in coastal sediments facing the River Arno estuary are up to 20 times higher than background levels in pristine sites of the Ligurian Sea.
  - Are related to the industrial discharge through river input, and have been reported to cause a decrease bacterial density and activity in sediments directly influenced by the river plume

# Toxics of the Mediterranean Sea

## Heavy metals

- Large accumulation of heavy metals has been observed in sediments facing the Besos and Llobregat river deltas in Spain
- By contrast analysis of dissolved Cd, Cu, Ni and Zn in the Adriatic Sea indicate that overall the zone is not contaminated with these metals and concentrations are similar to values reported in open ocean and other coastal systems



# Toxics of the Mediterranean Sea

## Pesticides

- *Aldrin, dieldrin, endrin and heptachlor*
- *DDT*

## Industrial compounds

- *Hexachlorobenzene (HCB)*
- *PCBs*

## Unintentional by-products

- *PCDD/PCDFs*

# Toxics of the Mediterranean Sea

Other PTSs of concern in the region

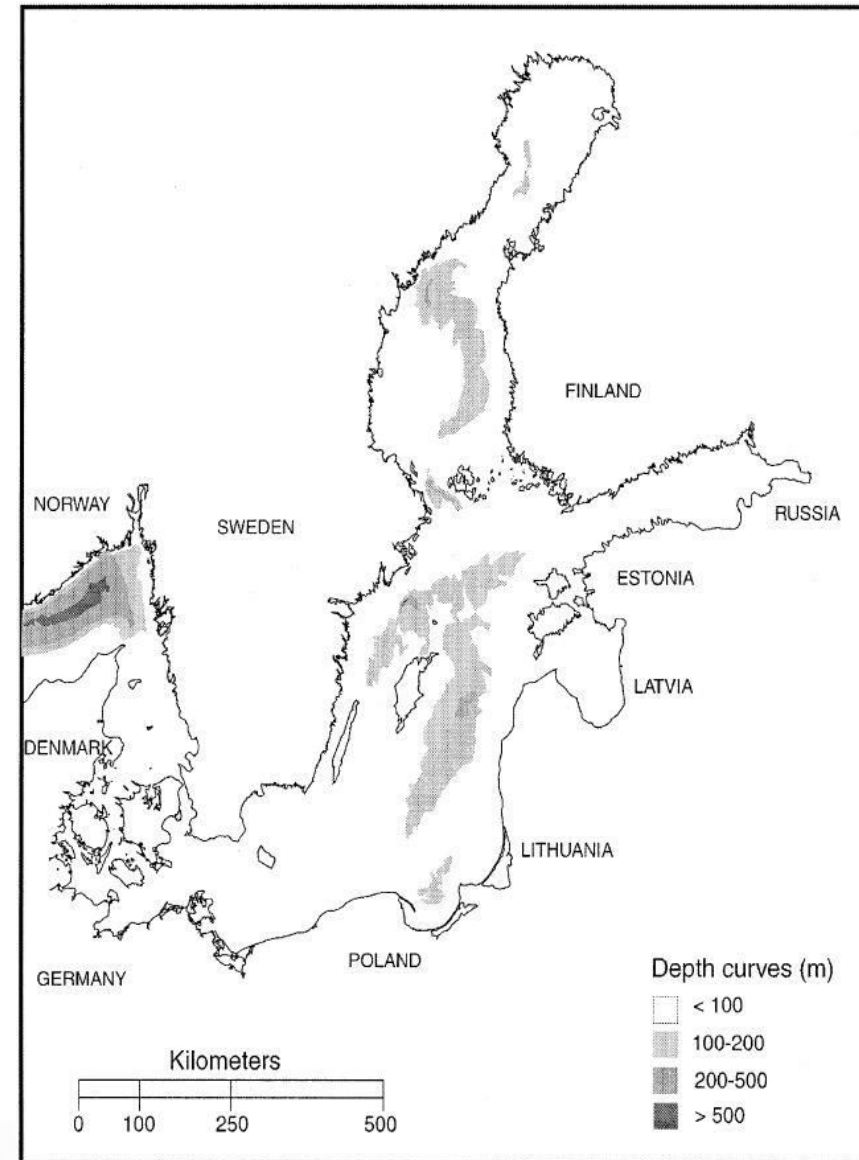
- *HCHs*
- *PAHs*
- *Alkylphenols*
- *Organomercury compounds*

# The special features of the Baltic Sea

## Overview

The Baltic Sea has various combination of climatic, geographic and ecological characteristics that make it highly sensitive to environment impacts

- Shallow sea, mean depth 54m, max depth 450m
- Barckish water, salinity 0,6%
- Water remains within the sea for up to 30 years



# The special features of the Baltic Sea Drainage Basin

- Four times larger than sea region
- Population 85 millions
- Active land use and heavy traffic

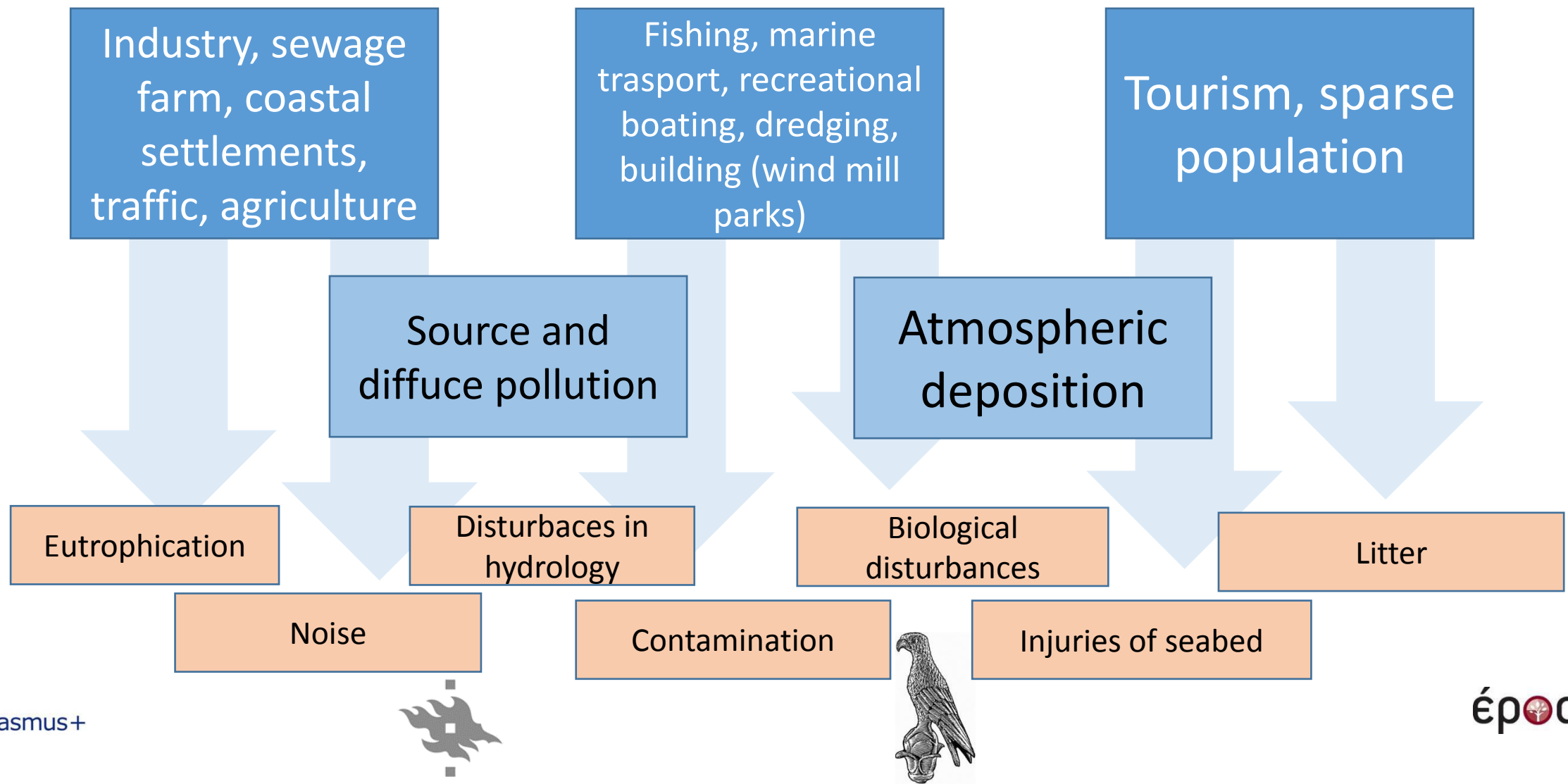
## Natural conditions and human impacts has together causes problems to the Baltic Sea

- There is many different type of problems in the Sea area.
- It's easier to find solution to some problems than other.
- Problems are connected to each others
- HELCOM has indentified 100 hotspots



# Problems of the Baltic Sea

## Overview



# Problems of the Baltic Sea

## The main reasons

- Increasing pressures to the ecosystem of the Baltic Sea Region
- Political challenges
  - Surrounded by 9 states, 14 states in drainage basin
  - International environmental cooperation depends: financial support, international organizations, attitude of states, international law and status of environmental problems
  - The Baltic Sea is a great example of international governance of maritime environment
- In 1892 was suggested that regular measurements of hydrographic parameters should be carried out.
  - Temperature, phosphore, nitrate has rised and other measurement has varied
  - Several different programs, laws, guides, settings etc.



# Problems of the Baltic Sea

## Eutrophication

- Eutrophication is the ecosystem's response to the addition of artificial or natural substances.
- Natural eutrophication is natural occurrence in the Baltic Sea
- Mechanism of eutrophication arises from the oversupply of nutrients, which includes explosive growth of plants and massive algae blooms.

## **What causes eutrophication?**

- Land use, tourism, oil & gas, coastal defence, ports & navigation, military activities, culture, conservation, dredging & disposal, submarine, cables, fishing, renewable energy, marine recreation, mineral extraction etc.
- About 80% of all nutrients in the sea come from land-based activities, including sewage, industrial and municipal waste and agricultural run-off

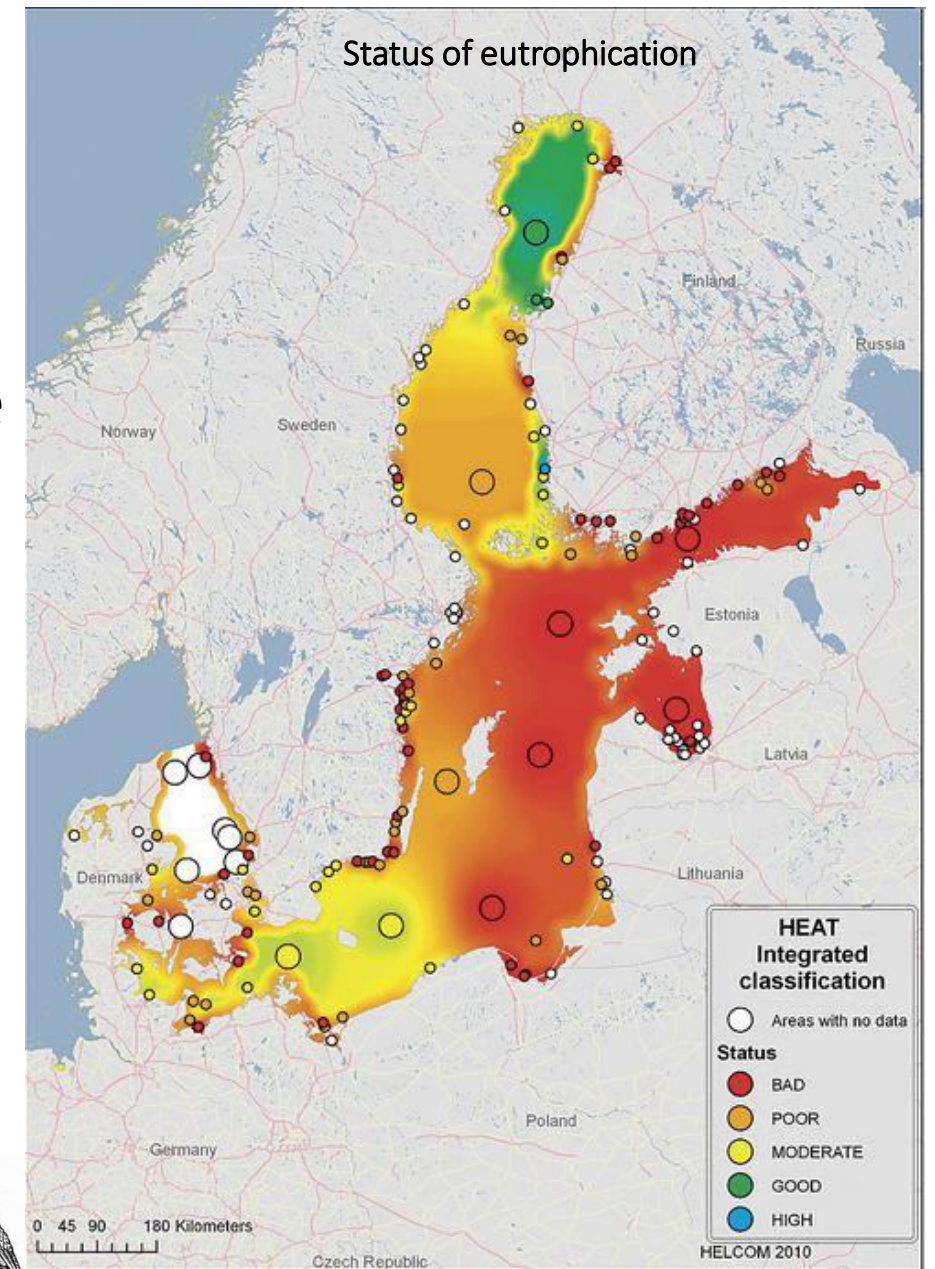




# Problems of the Baltic Sea

## Eutrophication

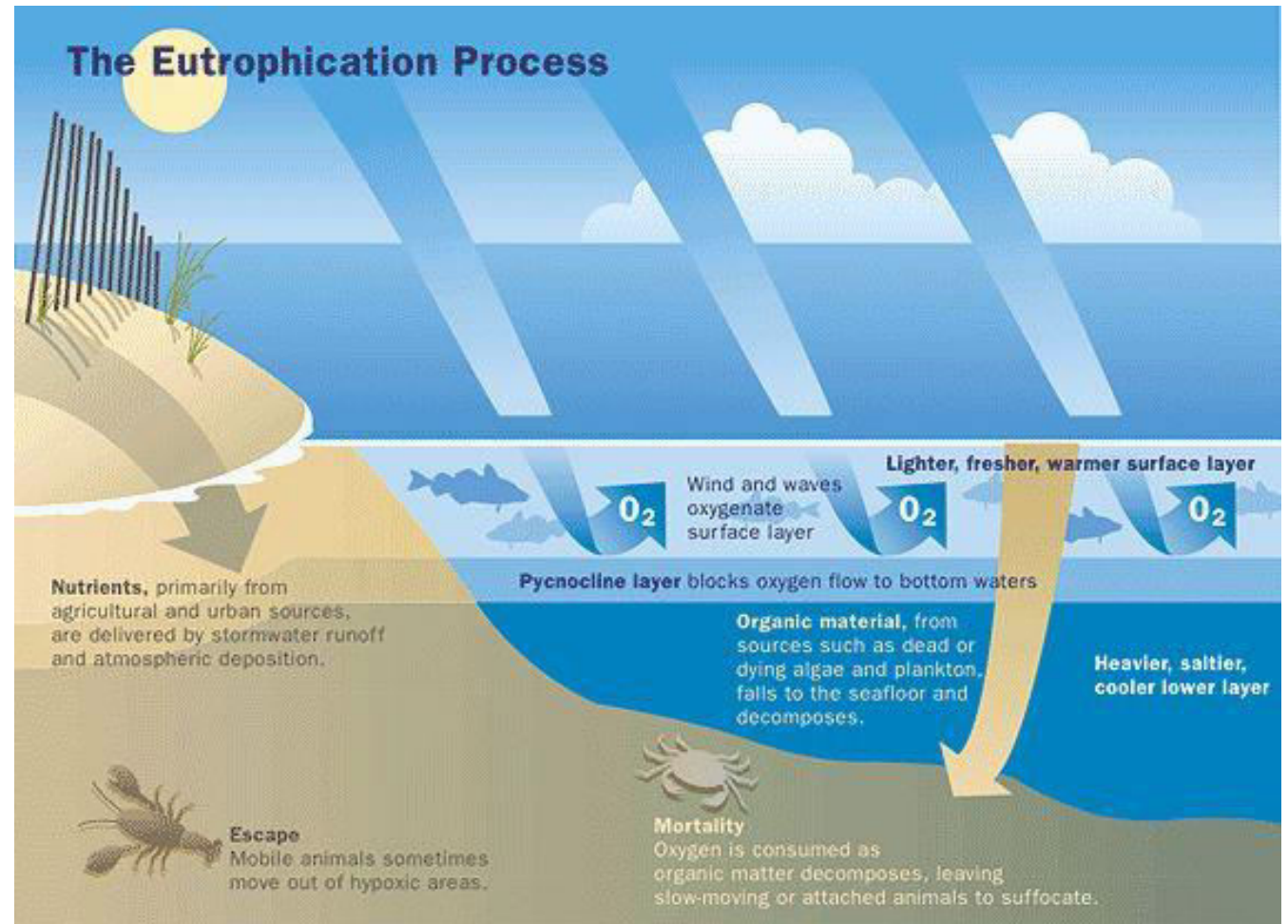
- The biggest sources of nutrient over load are Poland and Russia
- Moves of water will spread the problems to another sea areas, NIMBY "Not in my back yard"
- The researches show that all regions in the Baltic respond similarly to nutrient over-enrichment but there is local important variations



# Problems of the Baltic Sea

## Eutrophication

- Eutrophication process causes problems to the ecosystem in the sea
- Increasing activities in the Baltic
  - land use and heavy traffic, tourism



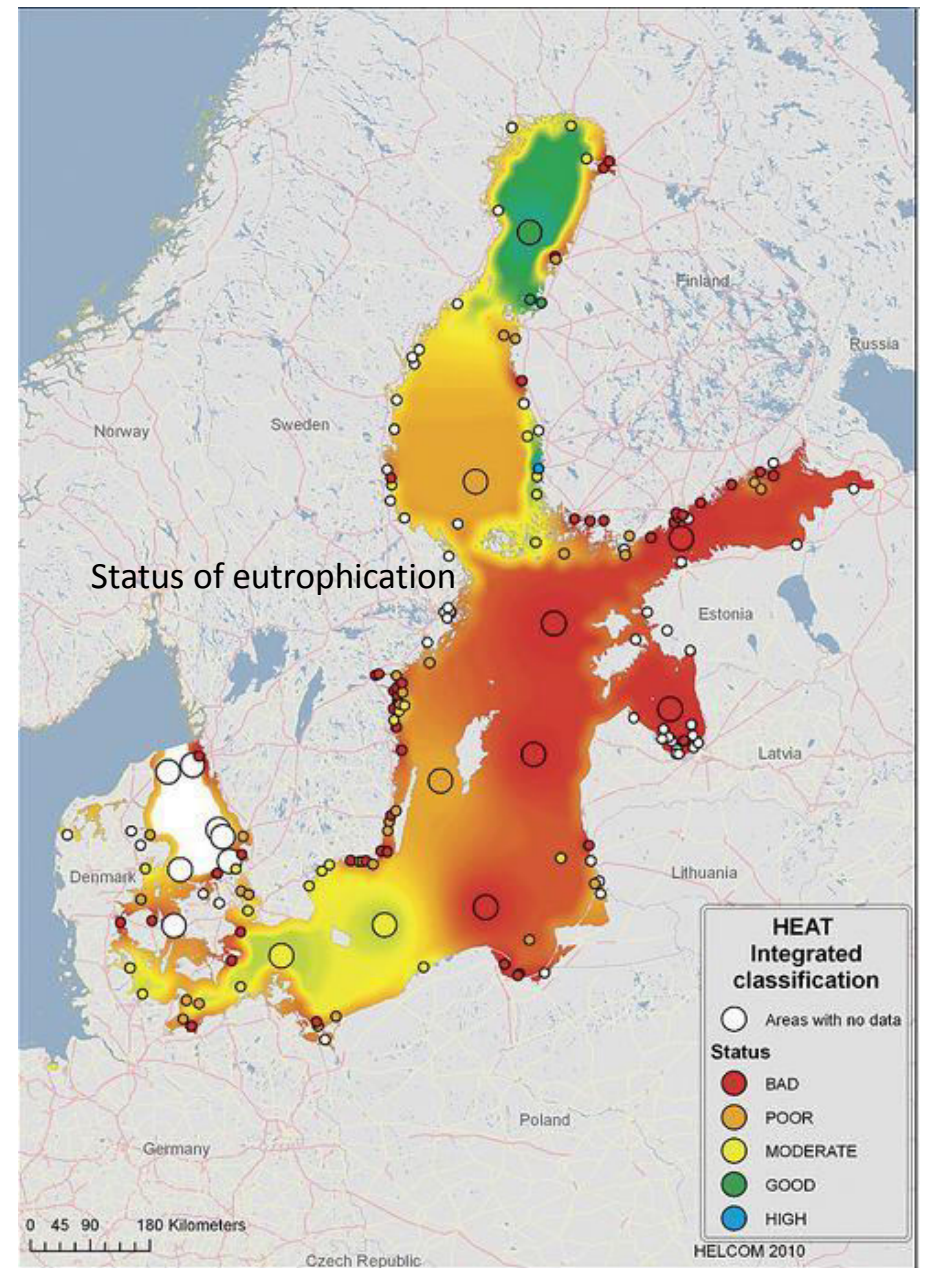
<https://www.flickr.com/photos/48722974@N07/4859897047>



# Problems of the Baltic Sea

## Eutrophication

- The biggest sources of nutrient over load are Poland and Russia
- Moves of water will spread the problems to another sea areas, NIMBY "Not in my back yard"
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# Problems of the Baltic Sea

## Eutrophication

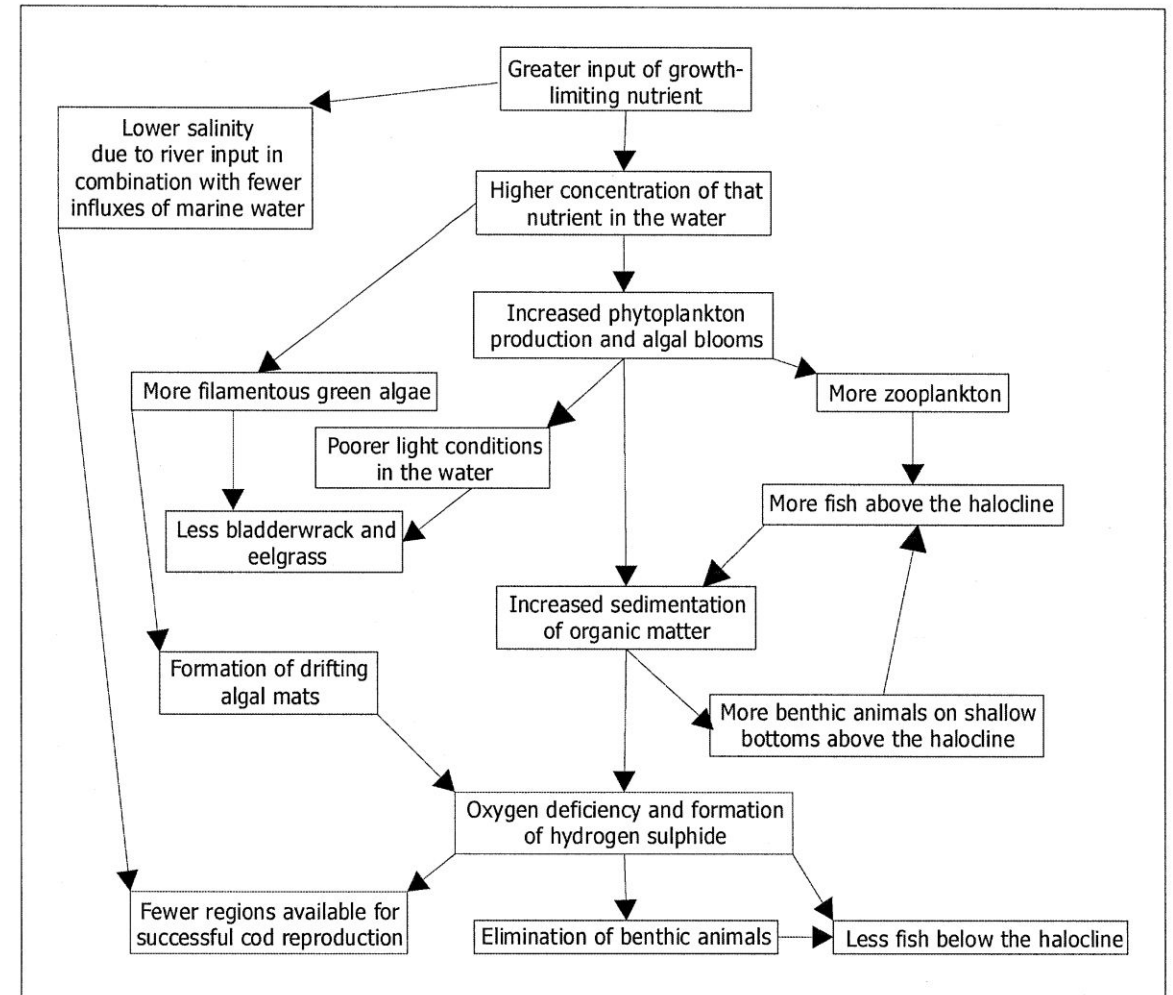
- Nutrient over-enrichment causes elevated levels of algae and plant growth, increasing turbidity, reduces dissolved oxygen in the water and affects the ecosystem and species composition
- Internal load of nutrients, cycle of phosphory: algae blooming-nitrogen runs out-algae dies-to sea bottom- digestion of nutriens- lack of oxygen- -phosphory dissolves in water- cyanobacters use it +nitrogen from air- nitrogen is released when cyanobacter dies.





# Problems of the Baltic Sea Eutrophication

- Surface water (0-40m) of sea moves to the counter day-ends from another country's coastal area.



Rönnberg & Bonsdorf 2004

**Bold text in box**

= small to moderate changes

**Bold text with thicker box borders**

= severe change

**Bold text with thickest box borders**

= very serious change

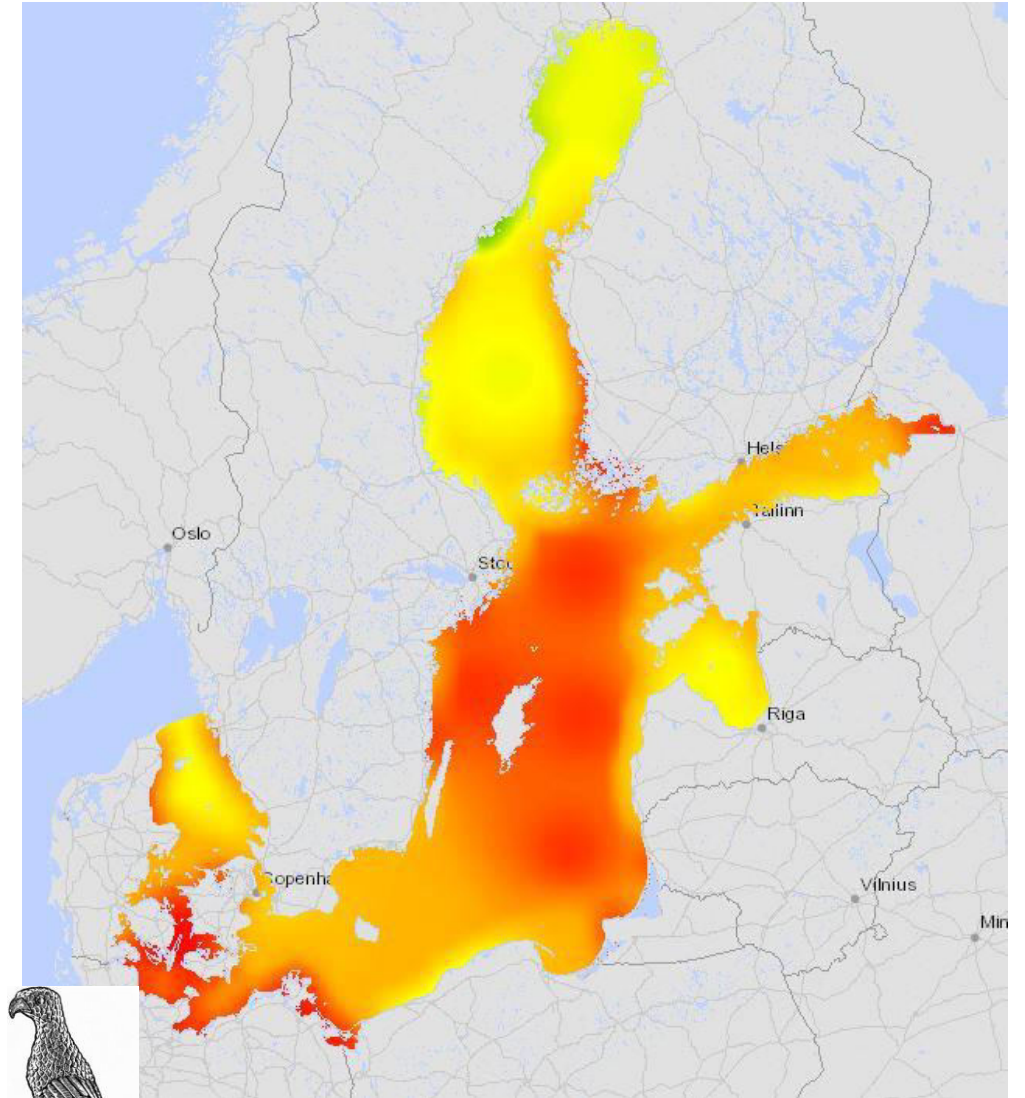


# Problems of the Baltic Sea

## Eutrophication

- Although efforts have been made, the load of nutrients have increased.
  - Pressure from agricultur
  - EU has increased cultivation areas

## Ecosystem health status



# Problems of the Baltic Sea

Increasing activities in the Baltic

- Port construction, road development, building of bridges, power plants, industrial production facilities, cables, pipelines, shipping routes, removal of sand/ gravel
- Windmill parks
- Other uses/ activities
- Maritime transportation and logistics, fisheries, aquaculture, recreation...
- Marine protection/ conservation is also a mode of use
- Oil transportation in the Baltic Sea has increased



# Doing Research

According to Fang et al. 2008

A 14-step Process of doing research:

- 1)** Choose a problem **2)** Review the literature **3)** Evaluate the literature
- 4)** Be aware of all ethical issues **5)** Be aware of all cultural issues
- 6)** State the research question or hypothesis
- 7)** Select the research approach
- 8)** Determine how the variables are going to be measured
- 9)** Select a sample **10)** Select a data collection method
- 11)** Collect and code the data **12)** Analyze and interpret the data
- 13)** Write the report **14)** Disseminate the report



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# Immanigġjar tal-problemi u nevitaw il- bidla fil-klima

## Managing problems and avoiding climate change

**Modulu 3 minn kors II: Is-sitwazzjoni attwali u futura taż-Żona Baltiku u l-Mediterran  
f'perspettiva interdixiplinari**

**Module 1 from course II: Current state and future of the Baltic an**

Katerina Plakitsi, Triantafyllos A. Albanis & Athina C. Kornelaki University of Ioannina / Università ta' Ioannina

Noora Kivikko University of Helsinki / Università ta' Helsinki



# Contents

- Course objectives
- Managing problems
  - The Mediterranean Sea
  - The Baltic Sea
- Avoid climate change
  - How it affect?
    - The Mediterranean sea area
    - The Baltic sea area
  - What can be done?

The teaching language at the University of Malta is English and therefore the course content is being presented in the English language to be used by any Maltese students/learners.

Il-lingwa tat-tagħlim fl-Università ta' Malta hija l-Ingliż u għalhekk il-kontenut tal-kors qed jiġi ppreżentat bil-lingwa Ingliża għal-użu tal-istudenti Maltin.

# Course objectives

- Main themes in this module are managing problems and avoiding climate change
- Situation of Mediterranean and Baltic Sea areas
- Different solutions of problems and importance of knowledge of cultural and environmental components in study area
- How to present and argue opinions



# Managing problems

- Find the range of potential solutions
  - De-materialise the economy, recycle the resources, de-carbonise the energy flows
- Search for lower cost methods
- Increase awareness
  - With the increasing environmental problems public awareness to the problems has also risen

# Managing problems

How to approach?

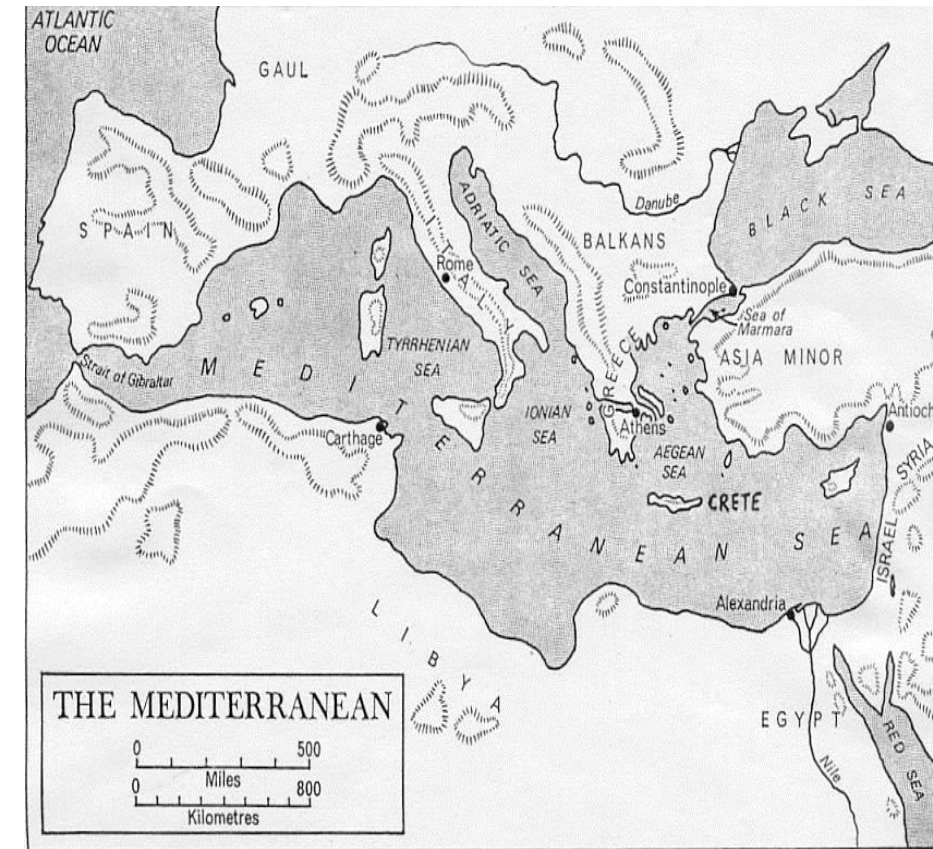
- 1) Basic (material or energy flows)
- 2) Sectors (industry, agriculture etc)
- 3) Societal framework (legal framework, governance)
- 4) Personal (lifestyle, ethics)

(Lars Rydén)

# Managing problems

## The Mediterranean Sea Overview

- the largest of the semi-enclosed European seas
- surrounded by 22 countries
- together share a coastline of 46 000 km
- 480 million people living across three continents: Africa, Asia and Europe
- one of the world's busiest shipping routes with about one-third of the world's total merchant shipping crossing the sea each year
- one-third of the Mediterranean population is concentrated along its coastal regions



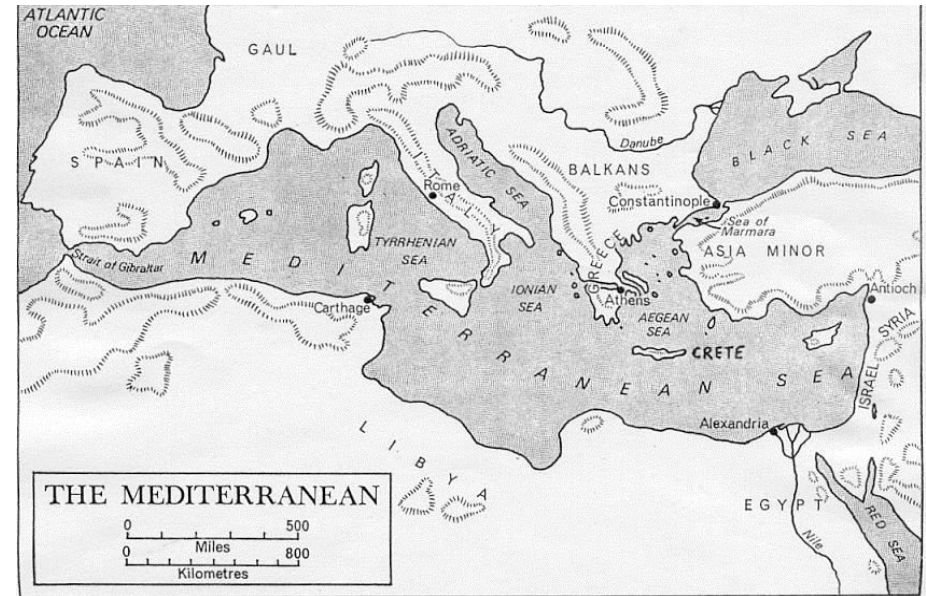
<http://www.viavilla.com/k/d615196903>

# Managing problems

The Mediterranean Sea

What causes the problems?

- Environmental pressures (population growth, growth of coastal urban hubs, tourism, shipping, fisheries)
  - Increased demand for water
  - Increased energy resources
  - Generation of air
  - Water pollution
  - Waste generation
  - Land consumption
  - Degradation of habitats, landscapes and coastlines



<http://www.viavilla.com/k/d615196903>

# Managing problems

## The Mediterranean Sea Problems/ Issues

- Pollution spans diverse activities including land-based activities, marine transport and sea-bed exploitation.
- Conservation of biodiversity.
- Sustainable exploitation of fishery resources

(EEA Report, 2006)

# Managing problems

## The Mediterranean Sea/ Management of Fisheries

### Fishery policies/frameworks:

- The United Nations Convention on the Law of the Sea (UNCLOS)
  - Food and Agriculture Organization (FAO)
    - General Fisheries Commission for the Mediterranean (GFCM)
    - MPAs
  - Regional Activity Center for Specially Protected Areas (RAC-SPA) (Tunis, 1985)
- The Convention on Biological Diversity (CBD)
- EU
  - Marine Strategy Framework Directive (2008/56/EC)
  - Common Fisheries Policy (CFP) (2371/2002/EC)
  - legislation regulates the minimum depth and distance offshore for trawling (EC Reg. 1967/2006)



(Pipitone et al., 2014) **époque**



# Managing problems

## The Mediterranean Sea/ MPAs

- The first MPAs were created in the 1960s
- 681 Mediterranean MPAs:
  - 170 national and international MPAs
  - 507 Natura 2000 sites
  - The Pelagos Sanctuary
  - 4 GFCM fisheries restricted areas
- Not other types of MMAs specifically for fisheries management

(Pipitone et al., 2014)



# Managing problems

## The Mediterranean Sea/ MMAs

- Fishery reserves
  - Etablissements de pêche (fishery establishments) and cantonnements de pêche (fishery reserves)
  - Off-shore managed areas
  - No-trawl areas
  - No-take zones
- Fisheries restricted areas
- Marine protected areas
- Biological protection zones
- Artificial reef areas
- Exclusive fishing zones

(Pipitone et al., 2014)



# Managing problems

The Mediterranean Sea

Research Agenda for De-Contamination/ SWOT Analysis

STRENGTHS	WEAKNESSES,
<ul style="list-style-type: none"><li>➤ Common awareness of the problem</li><li>➤ Regional Instruments such as ENPI and MAP.</li><li>➤ Well-developed national monitoring facilities in most countries</li><li>➤ Political support at Ministerial level (UfM)</li><li>➤ Well qualified and connected scientific community</li><li>➤ Observatories of contamination in all countries</li><li>➤ Social and business support</li><li>➤ Alignment with mainstream policy on resources efficiency, and environmental protection</li><li>➤ The region is open to innovation: desalination, reuse of waters, better coastal management</li></ul>	<ul style="list-style-type: none"><li>➤ Lack of common laws results oriented, regulations and enforcement mechanisms related to the subject.</li><li>➤ Lack of common standards and harmonized data base. Lack of accountability and transparency</li><li>➤ Lack of regional drought and flood strategy</li><li>➤ No integrated regional monitoring system</li><li>➤ No common repository of knowledge sources</li><li>➤ Insufficient area specific capacity building at scientific scale (human and material resources)</li><li>➤ Public awareness is weak at national level</li><li>➤ No effective incentives to engage in these actions</li></ul>

# Managing problems

The Mediterranean Sea

Research Agenda for De-Contamination/ SWOT Analysis

- No clear overall approach from the catchment scale to the sea
- Technology treatment is behind the state of the art of knowledge
- Lack of awareness of the importance of coastal and marine waters on the economy of the region
- Lack of long term strategy to increase water efficiency
- Low level of uptake of research results

# Managing problems

The Mediterranean Sea

Research Agenda for De-Contamination/ SWOT Analysis

OPPORTUNITIES	THREATS
<ul style="list-style-type: none"><li>➤ Demands of water creates the need for integration of waste water in water management strategies, and allows for lowering sea contamination</li><li>➤ Water scarcity as driver for innovation and sustainable water management (SWM)</li><li>➤ De-contamination of the Mediterranean,</li></ul>	<ul style="list-style-type: none"><li>➤ Time is working, the problem dimension increases</li><li>➤ Political blockage in agreeing common initiatives</li><li>➤ Alteration and destruction of habitats, decline of fish stock and biodiversity</li><li>➤ No early warning system</li><li>➤ Unknown effects of sewage and chemical</li></ul>

# Managing problems

The Mediterranean Sea

Research Agenda for De-Contamination/ SWOT Analysis

<p>is of common interest and a source for direct business activities impacting other sectors such as fisheries, tourism or transport. H2020 and SEIS, under development, will be reference actions and systems</p> <ul style="list-style-type: none"><li>➤ Appropriate Technology co-development and Transfer in pollution prevention and Innovation Provisions =&gt; Incentives</li><li>➤ Possible Joint Programming of riparian countries on De-Contamination and SWM issues</li><li>➤ Networking of research laboratories, integrated consortia with participation of all countries to deal with the problem.</li><li>➤ Search for harmonization of standards</li><li>➤ Direct access to research programming</li><li>➤ Development of the socio-economic dimension of research under a Mediterranean common interest</li></ul>	<p>pollution, particularly of emerging pollutants</p> <ul style="list-style-type: none"><li>➤ Implementation of policies, such as tourism development without incorporating the contamination prevention precautionary principle</li><li>➤ Increasing coastal urban and industrial development</li><li>➤ Increasing agricultural use of water without appropriate monitoring of diffuse contamination impact</li><li>➤ Population migration to the coastal and water availability area</li><li>➤ Water conflicts at regional level</li></ul> <p>(MIRA 2012). REPORT ON THE MEDITERRANEAN SEA POLLUTION SITUATION ADDRESSED BY THE HORIZON 2020 PROGRAM OF THE ENPI, AND CHALLENGES IN THE RESEARCH DOMAIN)</p>
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# Managing problems

The Mediterranean Sea

Main Laws and Regulations

- Barcelona Convention for the protection of the Sea
- ENPI Neighborhood Policy Program
- Other international agreements and tools of monitoring and data sharing on this issue (e.g. MEDPOL, SEIS, etc.)
- EU Member States → Water Framework Directive (WFD, 2000)
- Marine Policy Directive

Southern and eastern part of the Mediterranean Countries:

- National laws and regulations are the governing laws that ensure the preservation of water resources and water bodies. (MIRA 2012)



# Managing problems

The Mediterranean Sea

Main institutions

In the north:

- Ministries and National Agencies
- Basin Organizations
- River Basin Districts
- Regional Authorities
- Local Authorities
- Local management Structures
- User Associations (MIRA, 2012)



# Managing problems

The Mediterranean Sea  
What has been done?

## Pollution

- Regional agreements and policy instruments
  - SAP/MED: Strategic Action Programme in the Mediterranean for the implementation of the LBS Protocol to the Barcelona Convention
  - EU Water Framework Directive (WFD)
  - HAB related policies
- International conventions and policy instruments
  - The International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978, (MARPOL 73/78).
  - The Stockholm Convention on Persistent Organic Pollutants (POPs).
  - The Basel Convention strictly regulates the transboundary movements of hazardous wastes and provides obligations to its parties to ensure that such wastes and their disposal are managed of in an environmentally sound manner when moved across national boundaries.
  - The Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade.
  - International Code of Conduct on the Distribution and Use of Pesticide



# Managing problems

The Mediterranean Sea  
What has been done?

## Conservation of biodiversity

- Regional agreements and policy instruments
  - The Specially Protected Areas and Biodiversity Protocol to the Convention of Barcelona (SPA)
  - The Strategic Action Programme for Biodiversity in the Mediterranean Region (SAP/BIO)
- Other regional conventions, directives and action plans
  - The Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic area (ACCOBAMS) was made in 1996 under the Bonn Convention.
  - The Berne Convention (on the Conservation of European Wildlife and Natural Habitats) is being implemented in all the European countries.
  - Action plan for the conservation of cetaceans in the Mediterranean Sea.
  - Action plan for the management of the Mediterranean monk seal (*Monachus monachus*).
  - Action plan for the conservation of Mediterranean marine turtles.
  - Action plan for the conservation of marine vegetation in the Mediterranean Sea.



# Managing problems

The Mediterranean Sea

What has been done?

- International conventions
  - Global Convention on the Protection of Biological Diversity (CBD).
  - The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention, 1979).
  - The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).
  - The RAMSAR Convention on Wetlands of International Importance especially as Waterfowl Habitat (1971).

(EEA Report, 2006)

# Managing problems

## The Mediterranean Sea Challenges

- Fragmentation of institutions / Role duplication
- Legislative frameworks in the South and North are top down, i.e., the participative processes are limited.
- Lack of enforcement mechanisms at some southern countries and mainly at basin and trans-basin levels
- Lack of financial instruments and lack of incentive strategies to reduce pollution
- The provisions for multi-stakeholder participation and dialogue as well as public engagement are vague in the southern governance while it is better articulated in the north.
- Low accountability and transparency
- No clear provisions to support and encourage innovation, mainly in the southern part of the Basin.
- No clear link between, academia, stakeholders and industrial entities in the southern part of the Basin. Such interrelationships may support and encourage innovation approach

(MIRA, 2012)

# Managing problems

The Mediterranean Sea

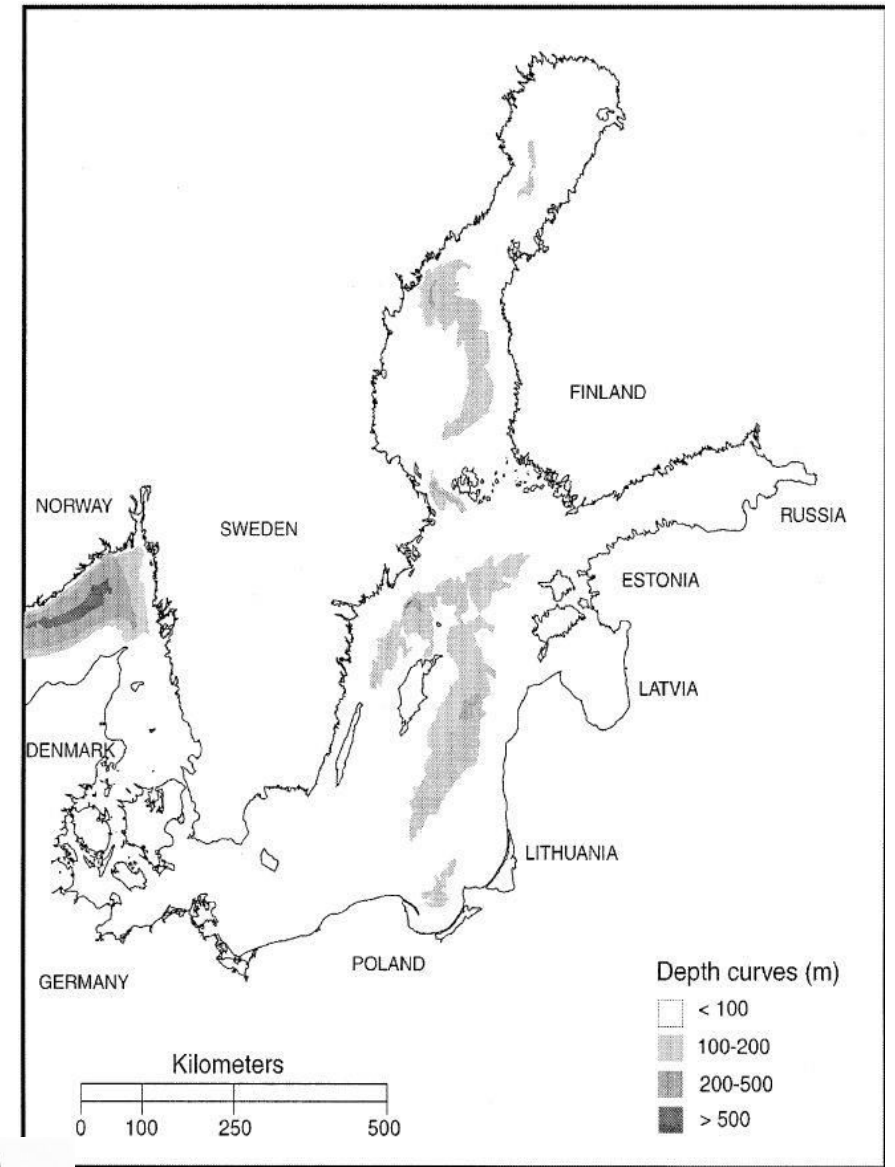
Recommendations

- “...in the Mediterranean region water shortages have historically provided the incentive to promote water-related technologies and saving practices, and the Region has been since pre-history the origin of important ‘technologies’ for the storage, treatment and reuse of waters. The main focus of action is currently shifting to the reuse of wastewater...” (MIRA, 2012)

# Managing problems

## The Baltic Sea Overview

- The Baltic Sea has various combination of climatic, geographic and ecological characteristics that make it highly sensitive to environment impacts.
  - Shallow
  - Water stratification
  - Poor water turnover
  - Large drainage basin (85 mill. people)
- The Baltic Sea has large variances and gradients in topography, geology, hydrography, climate, salinity and significant environmental variations between coastal areas, open sea, archipelago
- IMO has indentified the Baltic Sea as particularly sensitive sea area



(Rönning& Bonsdorff (2004))

époque

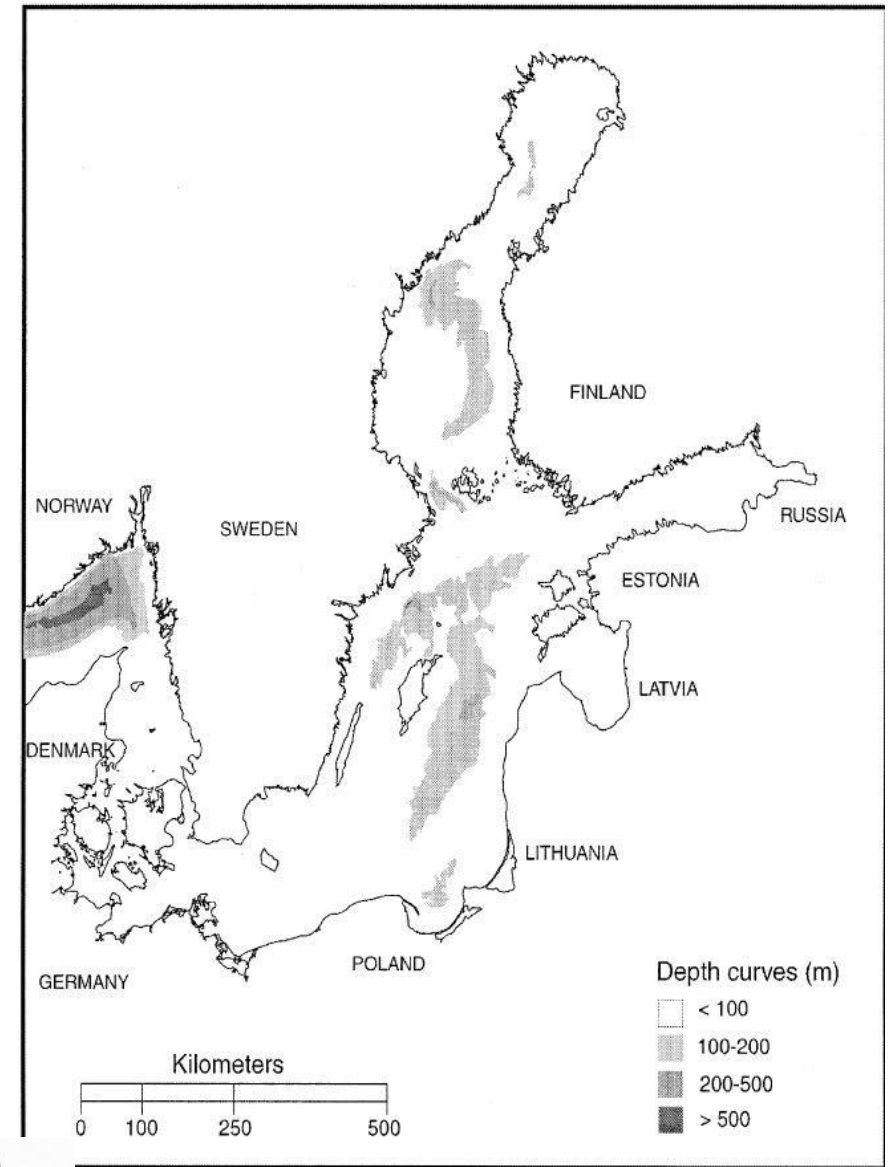


# Managing problems

## The Baltic Sea

### What causes the problems?

- Contaminations is caused by the long history of discharges from different sources
- Long history of discharges from industry and municipalizes, sewage, runoff from agriculture and air bone pollutants.
- Lot of research and potential solutions, gap between information and policy-makers
- Diversity of cultures and countries: resining opinions and political lines





# Managing problems

## The Baltic Sea

Four segments in Baltic Sea region:

- Eutrophication
- Hazardous substances
- Biodiversity and nature protection
- Maritime Activities

TOP THREE causes of pressure:

- 1) Nutrients
- 2) Fisheries
- 3) Pollution

(Laamanen)

4 problem areas

1. Energy
2. Transport
3. Urbanisation
4. Demography

(Lars Rydén)



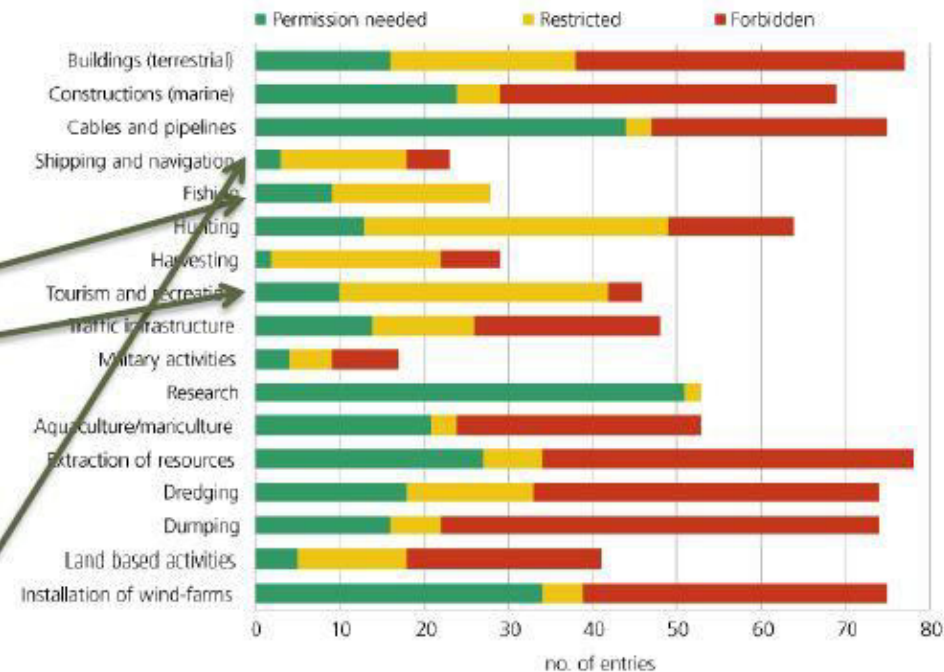
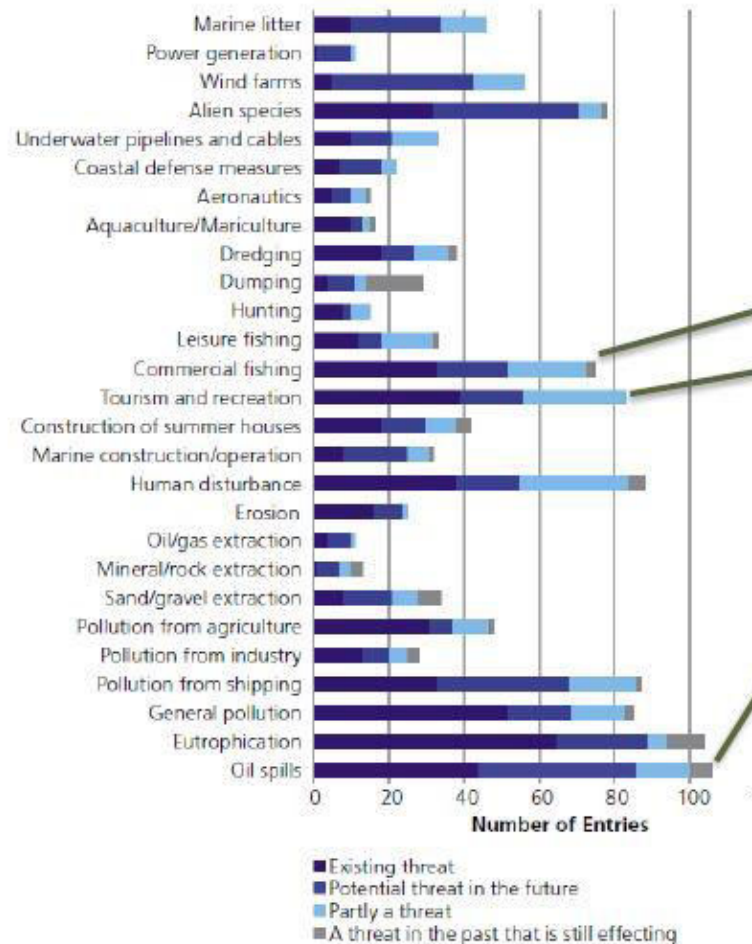
# Managing problems

The Baltic Sea

History of finding solutions

- Protection started 1972
- At the 14th Scandinavian Science Meeting in Copenhagen in 1892 was suggested an international co-operation between the various countries in order to conduct a rational investigation of the Baltic Sea.

# Do the protected areas provide good protection? Are human pressures in the MPAs managed?



**Restriction of human activities in the MPAs**

(Laamanen)

**Existing, potential or past threats in MPAs**



# Managing problems

The Baltic Sea

Challenges of managing problems

- The successful protection politic of the Baltic Sea can't be done without balance between hydrogeographic measurements, co-ownership and economic differences of the countries around the Baltic Sea region
- The base of managing problems should be economic and political realism
  - None of the countries around the Baltic Sea is forced to reduce the load of nutrients
  - The moral responsibility won't bring far-reaching results
- To save and protect the Baltic Sea the humanistic aspects is also needed- the Baltic Sea and it's differents stages have been home and way to move for millions of people before us
- The Baltic Sea is inland sea in EU, there is possibilities to cooperation between surrounded states



# Managing problems

The Baltic Sea

Where to start?

- Environmental technology, applications, renewable energy
- Seven steps according to WFF: **1)** Ban all uses of phosphates in detergents **2)** introduce a tax on N and P in mineral fertilizers **3)** ban fishing of eel until the stock is recovered and restore inland migration routes **4)** ratify the Ballast Water Convention **5)** clean up remaining Helcom hotspots **6)** provide adequate port reception facilities for cruise ship sewage **7)** establish a network of marine protected areas

# Managing problems

## The Baltic Sea, some international cooperation

- Baltic Sea Parliamentary Conference (BSPC)
- Baltic 21 - An Agenda for the Baltic Sea Region
- Baltic Farmers' Forum on Environment (BFFE)
- Baltic Operational Oceanographic System – BOOS
- Baltic Ports Organisation (BPO)
- Baltic Sea Forum (BSF)
- Baltic and International Maritime Council (BIMCO)
- BONUS Baltic Organizations' Network for Funding Science (BONUS EEIG)
- Coalition Clean Baltic (CCB)
- Conference of Peripheral Maritime Regions of Europe - Baltic Sea Commission (CPMR)
- Helsinki Commission (HELCOM)
- Union of the Baltic Cities (UBC)
- **EU** Strategy for the Baltic Sea Region
- Scientific cooperation: ICES; ESF Marine Board; Joint Programming; EU R&D



# Managing problems

The Baltic Sea

What has been done?

Much work have been done so the deteriorations has slowed.

- The Baltic Marine Environment Protection Commission (HELCOM since 1974)
  - Several different programs and plans: Baltic Sea Action Plan BSAP (Backer et al. 2010).
- Council of the Baltic Sea States (CBSS)
- International Maritime Organisation (IMO)
- EU Strategies for the Baltic Sea Region (EUSBSR macro area strategy)
- BalticSTERN- international research network
- Surveillance flight supervise oil spills from ships
  - Detect spills, identify of a polluter





# Managing problems

The Baltic Sea  
HELCOM

The Baltic Marine Environment Protection Commission, usually referred to as HELCOM, is an intergovernmental organization of the nine Baltic Sea coastal countries and the European Union working to protect the marine environment of the Baltic Sea from all sources of pollution and to ensure safety of navigation in the region. Since 1974, HELCOM has been the governing body of the 'Convention on the Protection of the Marine Environment of the Baltic Sea Area', more commonly known as the Helsinki Convention.

(HELCOM)



# Avoid climate change

## Overview

*"Climate change is natural term because changes in climate may result from internal dynamics, natural external factors, or antropogenic pressuress" (HELCOM 2013)*

*"The term "climate change" does not refer only to anthropogenic climate change, but is a broader term, including changes due to internal dynamics and natural external actors, as well as anthropogenic pressures" (HELCOM)*

- The trend of the global mean temperature show an increase of 0,05 °C per decade for period 1861 to 2000.
- Also the daily temperature cycle is changing and temperature extremes has been increasing.



# Avoid climate change

How it affects? The Mediterranean Sea

- Extreme events (Storms, gales, floods, thermal anomalies)
  - Massive habitat destruction
  - Scarce endemic species mortality
  - Stress induced epidemics
- Sea level rise
- Temperature increase → Migration Migration towards the North
  - Marine turtles:
    - Prompt nidification and short laying intervals
    - Low clutch success
    - Changes in distribution and abundance of the species
    - Migration routes modifications
    - Reduction of breeding beaches

# Avoid climate change

## How it affects? The Mediterranean Sea: Biodiversity

- Sesile invertebrates:
  - Risks of local populations extinction, loss of genetical diversity
- Fishes:
  - Physiological modifications and effects on reproduction
  - Migration alterations
  - Effects on growth rates and population dynamics
- Alien species:
  - Boosting of colonization and expansion towards the North
  - New arrived toxic phytoplankton species
- Birds:
  - Phenological changes (included migration)
  - Changes in distribution and geographical range
  - Impact on demographical parameters (performance of reproduction, eggs' size, laying dates, breeding success...)



# Avoid climate change

How it affects? The Mediterranean Sea

## Threatened coastal and marine habitats

- **Wetlands** (submersion by sea-level rise)
- **Sea grass beds** (changing sediment flux)
- **Coraligenous calcareous formations** (lack of opportunity for northwards migration after temperature increase)
- **Pelagic waters planktonic fringes** (Sea acidification by CO<sub>2</sub>, altered nutrients load and water transparency)



# Avoid climate change

How it affects? The Mediterranean Sea

## Threatened coastal and marine species

- **Isolated populations**

- Closed sea
- Not a migration pathway
- Most affected habitats of the coolest aeries

- **New warmer-waters species**

- Extinction of local populations
- Disease transmission
- Direct predation

- **High species biodiversity vs. Low population numbers → High niche specialization =>**

- extinction vortex and
- possibly limited resilience to climatic change



(Dr. Daniel CEBRIAN, 2008)



# Avoid climate change

How it affects? The Baltic Sea

- There are major differences between north and south, west and east regions in the Baltic Sea Basin
- For period 1861-2000 annual mean temperature trends show an increase of 0.11 °C per decade north of 60°N and 0.08 °C south of 60°N surface waters have warmed
- The daily temperature cycle is also changing and there has been an increase in temperature extremes
- Changes in the seasons: the length of the growing season has increased, whereas the length of the cold season has decreased
  - large change in the length of ice season
- Model simulations project generally continuing increasing (HELCOM)





# Avoid climate change

How it affects? The Baltic Sea

- Changes in large scale variations- storms and strong winds- big impact to ecosystem
- Increasing precipitation- increasing runoff surface water- increasing inputs of nutrients
- Future changes on the biochemical cycles
- Increasing areas of anoxia and hypoxia
- Changes in salinity

# Avoid climate change

How it affects? The Baltic Sea

- Changes in the composition of the spring bloom community - influence the benthos and zooplankton community composition - potential negative consequences for the food conditions and growth of the main plankton-eating fish, Baltic herring and sprat.
- Changes in seasonal succession of both phytoplankton and zooplankton and potentially increase the temporal mismatch between these groups in the spring.
- Changes in the composition of the spring bloom – also benthos
- Some aspects may have positive effects on littoral vegetation (HELCOM)

# Avoid climate change

## What can be done? The Baltic Sea

- Human pressures should be decreased to mitigate impacts on biodiversity
  - Decrease of inputs of nutrients, pollutants, hunting pressure, habitat disturbance, fishing and noise
  - Additional pressure of climate- sustainable actions
- Plan nutrient reduction measures, changes in land use and agriculture
- Ecologically coherent network of protected areas
  - Possible changes in the distribution of habitats and species
- Better knowledge
  - Monitoring, measurements
  - Data assimilation
  - Research
  - Communication plan

(HELCOM)

# Presenting an argument

Basic steps

## **1) Introduce the argument to the reader**

e.g. why it is a particularly relevant topic nowadays  
or refer directly to some comments that have been voiced on it recently.

## **2) Reasons against the argument**

State the position, the evidence and the reasons.

## **3) Reasons in favour of the argument**

State the position, the evidence and the reasons.

## **4) After summarising the two sides**

state your own point of view, and explain why you think as you do.

(<http://www.uefap.com/writing/function/argue.htm>)



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# Toxics u skart tal-bniedem mill- Bastimenti – Studju ta' Każ Toxics and human wastes of the ships- Case study

**Modulu 4 minn kors: Is-sitwazzjoni attwali u futura taż-Żoni tal-Baltiku u l-Mediterran f'perspettiva interdixxiplinarja.**

**Module 4 from course: Current state and future of the Baltic and Mediterranean Area in an interdisciplinary perspective.**

Katerina Plakitsi – Università ta' Ioannina / University of Ioannina

Noora Kivikko – Università ta' Helsinki / University of Helsinki



# Contents

- Course objects
- Case study research
  - Data
- Toxics and human waste of ships
  - Example
- Evaluation
- Dissemination

The teaching language at the University of Malta is English and therefore the course content is being presented in the English language to be used by any Maltese students/learners.

Il-lingwa tat-tagħlim fl-Università ta' Malta hija l-Ingliż u għalhekk il-kontenut tal-kors qed jiġi ppreżentat bil-lingwa Ingliża għal-użu tal-istudenti Maltin.

# Course objects

- Understands steps of case study research
- Put in a practice all topics covered in earlier studies
- Analyses and applicate earlier information in case study
- Evaluate researches validity
- Understanding of importance of dissemination

# Case study research

## Overview

- Empiric research
- Useful tool for investigate trends and specific situations
- One of the most popular strategy to collect qualitative data
  - Is an in depth study of a particular situation, very broad field of research
  - Especially: Social science, psychology, anthropology and ecology
- Test theoretical models in real world
- Will give indications, hypothesis creation and allow further elaboration
- Realistic responses (real world vs. computer model)



# Case study research

## Desinging

- Single- case or Multiple- case
- Focus on specific case
- Attempt to test a theory
- Is the subject relevance?
- Plan and design: how study is addressed and how collected data is relevant?
- Be passive in your research- be observer
- Case must be treated individually



# Case study research

## Results

- Analyzing the results: opinion based
- Emphasis is placed on exploration and description.
- Judge trends not analyze all data
- No right or wrong answer in case study

# Data

There are six types of data collected in case studies:

- Documents.
- Archival records.
- Interviews.
- Direct observation.
- Participant observation.
- Artifacts.
- Evaluation

*(Colostate)*

## **Good to know:**

*Case studies are to be much more convincing and accurate if they are based on several different sources of information*



# Case studies in sea regions

- Mapping the impact of alien species on marine ecosystems: the Mediterranean Sea case study (*Katsanevakis, Tempera, Teixeira*)
- Coexist-project:
  - Case study 1: Hardangerfjord
  - Case study 2: Atlantic coast areas
  - Case study 3: algarve coast
  - Case study 4: Adriatic Sea coast
  - Case study 5: Coastal North Sea
  - Case study 6: Baltic Sea

# Seven research themes according to BONUS

- Linking science and policy
- Understanding climate change and geophysical forcing
- Combatting eutrophication
- Achieving sustainable fisheries
- Protecting biodiversity
- Preventing pollution
- Integrating ecosystem and society

(Sirola)

***All examples can be done through case study research***

# Toxics and human wastes of the ships- Case study example

- Case study in the Baltic Sea in VECTORS investigated the mechanisms and identified impacts of selected key drivers on the Baltic ecosystem components, its goods and services, related socio - economic consequences, including governance and policy aspects
- VECTORS developed and improved models to understand the eutrophication effects and interactions with climate and alien invasions, and performed scenario simulations of potential future developments
- In this study shipping was a major vector of introduction of non - indigenous species to the ecosystem
- Involved experimental case studies, applications, field investigations, statistical analyses and modelling approaches.

*(Austen)*

# Toxics and human wastes of the ships

*In this case study you do research about toxics and human wastes of the ships. Idea is connect these themes to some another area/field what you find interesting.*

*Example:*

- 1) Select one harbour from World port source:  
[http://www.worldportsource.com/waterways/systems/maps/Baltic\\_Sea\\_Region\\_21.php](http://www.worldportsource.com/waterways/systems/maps/Baltic_Sea_Region_21.php)*
- 2) Get information about pressures and activities around this port region*
- 3) Then select indicators which reflects toxics/pollution from HELCOM Mpas "Species"  
<http://mpas.helcom.fi/apex/f?p=103:1::::::>*
- 4) Get familiar with refereces about this issue and around of it.  
Try this: [http://havsmiljoinstitutet.se/digitalAssets/1506/1506887\\_sime\\_ais\\_report\\_2014\\_5.pdf](http://havsmiljoinstitutet.se/digitalAssets/1506/1506887_sime_ais_report_2014_5.pdf)*
- 5) Select interesting variables from HELCOM Mpas ( try: europication, oil spils etc.)*
- 6) Try to find connections between variables and indicators in this spesific port region whit selected methods and applications. Methodology may be applied to this specific case study from widely applicable methodology*



# Aspects of dissemination

- Lectures
- Social media
  - Facebook updates, Instagram publications, blog posts
- News, articles
  - Local news, national news, magazines,
- Posters
- Actions
- Workshops



# References

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- <http://writing.colostate.edu/guides/guide.cfm?guideid=60>
- [http://mpas.helcom.fi/apex/r/mpa/files/static/v9Y/Short%20instructions\\_HELCOM%20MPA%20database.pdf](http://mpas.helcom.fi/apex/r/mpa/files/static/v9Y/Short%20instructions_HELCOM%20MPA%20database.pdf)

L-intraprenditorija hija l-kapaċità u r-rieda li tiżviluppa, torganizza u tmexxi negozju flimkien mar-riskji tagħha sabiex tagħmel il-profitt. L-iktar eżempju ovvj u tal-intraprenditorija huwa l-bidu ta' negozji ġodda. Fl-ekonomija, l-intraprenditorija flimkien mal-art, ix-xogħol, ir-rizorsi naturali u l-kapital jistgħu jipproduċu profitt. L-ispiritu intraprenditorjali huwa kkaratterizzat mill-innovazzjoni u t-teħid tar-riskji, u huwa parti essenzjali tal-kapaċità ta' nazzjon li jirnexxi fis-suq globali dejjem jinbidel u dejjem aktar kompetittiv.

Hekk kif is-settur tal-enerġija qed tinbidel u tiffoka aktar fuq sorsi ta' enerġija rinnovabbli, filwaqt li jintegra dejjem aktar teknoloġiji diġitali matul l-istadji kollha tal-katina tal-enerġija, l-ħarġet fergħa ġdida ta' intraprenditorija li tissejjaħ l-intraprenditorija ħadra. Negozji ħodor huma negozji li huma impenjati li jnaqqsu l-impatt tagħhom fuq l-ambjent jew, u jiffokaw fuq skala akbar ta' sostenibbiltà. F'din id-direzzjoni, matul l-aħħar għaxar snin, il-kunċetti ta' "Enerġija Intelligenti" u "Smart Grid" ġew implimentati b'mod wiesa', sabiex jipprovdu infrastruttura avvanzata li se tiffacilita l-użu aktar sostenibbli u effettiv tal-enerġija, il-partecipazzjoni attiva tal-konsumaturi u ż-żieda fl-integrazzjoni ta' sorsi tal-enerġija rinnovabbli. L-intraprenditorija ħadra diġà sabet il-post tagħha u bħalissa qegħda tespandi f'oqsma ta' applikazzjoni differenti, bħal bliet intelligenti u t-trasport. Il-motivazzjoni, l-ambitu u l-impatt ta' approċi ħodor ivarjaw fost dawn l-oqsma, fejn bosta ICTs huma kkombinati sabiex jinkiseb użu effiċjenti u sostenibbli tal-enerġija.

Dan il-kors jiddeskrivi l-prinċipji bażiċi tal-intraprenditorjat, kif ukoll il-kunċett ta' Enerġija Intelligenti. Imbagħad jipprovdi l-harsa ġenerali tal-intraprenditorija ħadra flimkien ma' setturi ta' applikazzjoni differenti u jippreżenta pjan ta' negozju relattiv li jipprovdu studenti bi studju ta' każ ta' kif intraprenditorija ħadra hija attwalment realizzata.





**Kors 3**  
**Intraprenditorija - Energija Intelliġenti**

**MODULU 1 – ENERĠIJA INTELLIĠENTI**

Title	Deskrizzjoni
<b>Livell</b>	
<b>Semestru</b>	
<b>ECTS</b>	3
<b>lingwa tat-tagħlim</b>	Ingliz
<b>Numru ta' lectures</b>	3
<b>Numru ta' laboratorji</b>	-
<b>Homework</b>	<p><b>Assenjament 1:</b> L-istudent huwa mitlub jelabora fuq lista estiża tar-raġunijiet ewlenin li jwasslu għall-adozzjoni tal-kunċett ta' Energija Intelliġenti, u li jenfasizzaw l-impatt tagħha, ikklassifikati f'oqsma varji (eż ambjent, is-soċjetà, l-ekonomija, ġestjoni tal-enerġija, eċċ)</p> <p><b>Assenjament 2:</b> L-istudenti se jintalbu jiktbu dwar l-opportunitajiet ta' grid intelliġenti fil-pajjiżi tagħhom</p> <p><b>Assenjament 3:</b> Ibbażat fuq l-arkitettura ġenerika pprezentata minn grid intelliġenti u l-għarfien fuq s-settings u l-ħtiġijiet universitarji, l-istudenti se jkunu mitluba jiddisinnaw arkitettura ta' grid intelliġenti għall-kampus universitarju kbir b'integrazzjoni tar-riżorsi ta' enerġija rinnovabbli u jiddefinixxu politika ta' ġestjoni tal-enerġija sabiex tinkiseb is-sostenibbiltà u timmassimizza l-effiċjenza fil-konsum tal-enerġija.</p>
<b>Laqgħat / tutorja</b>	
<b>Għanijiet tal-kors</b>	<ul style="list-style-type: none"> <li>Jipprovdi ħarsa ġenerali tal-istatus globali attwali tal-enerġija u tintroduci l-kunċett tal-enerġija intelliġenti</li> <li>Jiddeskrivi l-power grid attwali u l-motivazzjoni ta' ċaqliq lejn il-grid intelliġenti</li> <li>Jipprezenta ħarsa ġenerali arkitettonika tal-grid intelliġenti, il-karatteristiċi u l-benefiċċji bażiċi</li> <li>Jiddeskrivi l-komponenti maġġuri u l-ICTs aktar importanti implimentati fil-grid intelliġenti</li> </ul>
<b>Kontenut tal-kors</b>	<ul style="list-style-type: none"> <li>Introduzzjoni għall-Energija intelliġenti</li> <li>Il-kunċett smart grid</li> <li>Il-komponenti u teknoloġiji ta' grid intelliġenti</li> </ul>
<b>Valutazzjoni</b>	Evalwazzjoni tal-assenjamenti



MODULU 2 – ENTRAPRENDORIJA ĦADRA

Title	Deskrizzjoni
<b>Livell</b>	
<b>Semestru</b>	
<b>ECTS</b>	3
<b>lingwa tat-tagħlim</b>	Ingliz
<b>Numru ta' lectures</b>	1
<b>Numru ta' laboratorji</b>	
<b>Homework</b>	<p>Assenjament 1: Identifikazzjoni ta' prassi tajba fil-qasam tal-Green Business u elaborazzjoni fuq il-prinċipji tas-CSR ambjentali li huma jindirizzaw, kif ukoll il-prinċipji tal-intraprenditorija</p> <p>Assenjament 2: Żvilupp ta' pjan ta' marketing skond il-prassi tajba identifikati f'Assenjament 1</p>
<b>Laqgħat / tutorja</b>	
<b>Għanijiet tal-kors</b>	<ul style="list-style-type: none"> <li>• Introduzzjoni għall-prinċipji bażiċi tas-CSR ambjentali;</li> <li>• Żvilupp ta' idejat bbażati fuq il-prinċipji tal-intraprenditorija ħadra</li> <li>• Kitba ta' abbozzi ta' pjanijiet ta' marketing għall-Green Business Paper;</li> <li>• Fehim tar-regoli u r-regolament ta' Starting Your Green Business</li> <li>• Kitba ta' abbozz ta' pjan ta' negozju għall-Green Business Paper</li> <li>• Familjarizzazzjonit tal-istudenti ma' applikazzjonijiet ta' intraprenditorija ħadra</li> </ul>
<b>Kontenut tal-kors</b>	<ul style="list-style-type: none"> <li>• X'inh i-intraprenditorija?</li> <li>• Prinċipji tas-CSR (pilastru ambjentali) u x'inh u Green Business?</li> <li>• Setturi ta' applikazzjoni ta' intraprenditorija ħadra</li> <li>• Inti lest biex tibra intraprenditorija ħadra?</li> <li>• Il-ħolqien u l-analizi tal-ideja</li> <li>• Pjan ta' Marketing</li> <li>• Konformità mal-Regoli u r-Regolamenti ta' Start Your Green Business</li> <li>• Bidu tan-Negozju Aħdar – Użu ta' PDCA f'Business Plan</li> </ul>
<b>Valutazzjoni</b>	<p>Assenjament Finali: Elaborazzjoni ta' pjan ta' negozju għal idea tan-negozju aħdar.</p>



MODULU 3 – SETTURI TA' APPLIKAZZJONI TA' GREEN ENTREPRENEURSHIP

Title	Deskrizzjoni
<b>Livell</b>	
<b>Semestru</b>	
<b>ECTS</b>	3
<b>lingwa tat-tagħlim</b>	Ingliz
<b>Numru ta' lectures</b>	3
<b>Numru ta' laboratorji</b>	
<b>Homework</b>	<p>Assenjament 1: L-istudenti se jintalbu jidentifikaw it-teknoloġiji implimentati u l-komponenti tas-sistema meħtieġa għat-twettiq ta' dawl intelligenti tat-toroq</p> <p>Assenjament 2: L-istudenti se jkunu mitluba jiddeskrivu l-kunċett aħdar ta' sistemi HVAC, il-komponenti bażiċi tagħhom u t-teknoloġiji ewlenin użati għat-twettiq tagħhom.</p> <p>Assenjament 3: L-istudenti jridu jipprovdu ħarsa ġenerali tal-infrastruttura eżistenti għall-iċċarġjar ta' vettura elettrika u jiddeskrivu l-perspettivi tal-evoluzzjoni tagħha.</p>
<b>Laqgħat / tutorja</b>	
<b>Għanijiet tal-kors</b>	<ul style="list-style-type: none"> <li>Jiffamiljarizza l-istudenti b'applikazzjonijiet fid-dinja reali tal-intraprenditorija ħadra</li> <li>Tipprovdi ħarsa ġenerali tal-istatus attwali tal-enerġija fil-livell ta' belt u jintroduċi l-kunċett ta' belt intelligenti</li> <li>Tippreżenta l-implimentazzjoni tal-enerġija intelligenti fid-dawl fit-toroq u t-tiżnin u tkessiħ distrettwali</li> <li>Tiddeskrivi l-applikazzjoni ta' enerġija intelligenti fil-bini</li> <li>Tiddeskrivi l-applikazzjoni ta' enerġija intelligenti fil-vetturi tat-trasport u vetturi elettrici</li> </ul>
<b>Kontenut tal-kors</b>	<ul style="list-style-type: none"> <li>bliet li jużaw enerġija intelligenti</li> <li>enerġija intelligenti fil-bini</li> <li>enerġija intelligenti fit-trasport</li> </ul>
<b>Valutazzjoni</b>	Evalwazzjoni tal-assignments



MODULU 4 – STUDJU TA' KAŻ TA' INTRAPRENDITORIJA ĦADRA

Title	Deskrizzjoni
Livell	
Semestru	
ECTS	6
lingwa tat-tagħlim	
Numru ta' lectures	1
Numru ta' laboratorji	1
Homework	
Laqgħat / tutorja	
Għanijiet tal-kors	<ul style="list-style-type: none"> <li>Fehim tad-differenza bejn l-implimentazzjoni ta' miżuri sostenibbli u s-sostenibbiltà b'halha prinċipju</li> <li>Kapaċità li tagħmel differenza bejn is-sostenibbiltà f'intrapriżi kbar u żgħar / medji</li> <li>Nifhmu l-istruttura tal-kumpaniji</li> <li>Nifhmu l-importanza tal-klijenti u l-indirizzar tal-ħtiġijiet tagħhom</li> <li>Għarfien tal-vantaġġi / żvantaġġi tal-implimentazzjoni tal-miżuri sostenibbli fin-negozju</li> <li>Kapaċità li tirraġuna fuq il-benefiċċji ta' soluzzjonijiet smart / ħodor kontra dawk tradizzjonali.</li> </ul>
Kontenut tal-kors	<p>Deskrizzjoni ta' studju ta' każ ibbażat fuq eżempju ta' Philips Lighting. Il-mudell tan-negozju huwa li Philips joffri l-apparat tad-dawl b'halha servizz minflok prodott bi qbil tal-ispiza fuq tul ta' żmien u mfassal għall-bżonnijiet tal-klijenti. Barra minn hekk, il-benefiċċji ta' dawn il-miżuri huma deskritti kemm minn naħa tal-klijent kif ukoll minn naħa tal-kumpanija kif ukoll mill-perspettiva ambjentali. Fl-aħħarnett, is-sewwieqa u l-ostakli għall-mudell kummerċjali huma identifikati, li huma speċjalment mmirati lejn kwistjonijiet ambjentali.</p>
Valutazzjoni	<p>L-istudenti huma mistiedna li jwieġbu domandi riflettivi, li huma mmirati lejn l-għarfien tagħhom tal-istudju tal-każ kif ukoll fuq l-għarfien tagħhom tal-intraprenditorija ħadra b'mod ġenerali.</p>



KORS III. INTRAPRENDITORIJA - ENERĠIJA INTELLIĠENTI

MODULU 1 (ENERĠIJA INTELLIĠENTI) - HANDOUT

<p><b>Introduzzjoni</b></p>	<p>Is-settur tal-enerġija qed jinbidel u jiffoka fuq sorsi ta' enerġija rinnovabbli, filwaqt li jintegra dejjem aktar teknoloġiji diġitali matul l-istadji kollha tal-katina tal-enerġija. Matul dawn l-aħħar għaxar snin, il-kunċetti ta' "Enerġija Intelliġenti" u "Smart Grid" ġew implimentati b'mod wiesa', sabiex jipprovdu infrastruttura qawwa u avvanzata. Din il-bidla se tiffaċilita l-użu aktar sostenibbli u effettiv ta' enerġija, il-partecipazzjoni attiva tal-konsumaturi u integrazzjoni akbar ta' sorsi tal-enerġija rinnovabbli.</p> <p>Mibni fuq dan il-qafas, dan il-modulu għandu l-għan li jiffamiljarizza l-istudenti bl-istatus attwali ta' enerġija u jintroduci l-elementi fundamentali tal-kunċett tal-Enerġija Intelliġenti. Il-modulu mbagħad jippreżenta aspetti varji ta' Smart Grid u jipprovdi paragon bejn grids tradizzjonali u dawk intelliġenti biex jgħin lill-istudenti jidentifikaw l-karatteristiċi fundamentali bżonnjużi fil-mixja lejn grid aktar intelliġenti. Skop prinċipali ta' dan il-modulu hu li jipprovdi informazzjoni dwar l-arkitettura, il-komponenti u l-oqsma teknoloġiċi ta' grid intelliġenti, sabiex l-istudenti jkunu kompetenti fit-tfassil ta' grids intelliġenti u fl-għażla l-aktar teknoloġiji adegwati għat-twettiq tagħhom. Fl-aħħarnett, bosta inizjattivi Ewropej u internazzjonali fil-qasam tal-Enerġija Intelliġenti huma diskussi fil-qosor.</p>
<p><b>Deskrizzjoni</b></p>	<p><b>Lecture:</b> Introduzzjoni għall-enerġija li tiffoka fuq sorsi ta' enerġija, l-istatus globali tal-enerġija attwali, il-projezzjonijiet u l-prospetti tal-istatus tal-enerġija fil-ġejjieni, kif ukoll il-problemi u l-isfidi tal-enerġija. Il-kunċett u l-impatt mistenni ta' Enerġija Intelliġenti huma deskritti. Il-grid tal-elettriku eżistenti hija ppreżentata flimkien mal-limitazzjonijiet tagħha u l-htieġa li jiġi adottat approċċ aktar "intelliġenti". Deskrizzjoni dettaljata tal-prinċipji fundamentali ta' grids intelliġenti, il-karatteristiċi tagħhom, l-arkitettura u l-mudell konċettwali, komponenti maġġuri, kif ukoll l-oqsma teknoloġiċi li qed jiġu implimentati tul il-katina ta' enerġija fi hdan grid intelliġenti. Diskussjoni tal-oġġettivi tal-grid intelliġenti, tal-fatturi ta' suċċess ewlenin u l-benefiċċji fuq il-grid tradizzjonali. Deskrizzjoni qasira tal-inizjattivi Ewropej u internazzjonali relattivi.</p> <p><b>Assenjament 1:</b> L-istudenti jridu jellaboraw fuq lista estiża tas-sewwieqa li jwasslu għall-adozzjoni tal-kunċett ta' Enerġija Intelliġenti, u ieħor li tenfasizza l-impatt tiegħu, ikklassifikat fl-oqsma varji (eż ambjent, is-soċjetà, l-ekonomija, ġestjoni tal-enerġija, eċċ)</p> <p><b>Assenjament 2:</b> L-istudenti jridu jiktbu l-opportunitajiet madwar grid intelliġenti fil-pajjiżi tagħhom.</p> <p><b>Assenjament 3:</b> Ibbażat fuq l-arkitettura generika ppreżentata minn grid intelliġenti u l-għarfien tagħhom fuq settings u l-htigijiet universitarji, l-istudenti se jkunu mitluba li jiddisinjaw arkitettura ta' grid intelliġenti għal kampus ta' università b'integrazzjoni tar-riżorsi ta' enerġija rinnovabbli u jiddefinixxu politika ta' ġestjoni tal-enerġija sabiex tinkiseb is-sostenibbiltà u timmassimizza l-effiċjenza fil-konsum tal-enerġija.</p>



<p><b>Referenzi</b></p>	<p>U.S. Energy Information Administration (2014). <i>International Energy Outlook</i>, Report, DOE-EIA-0484(2014)</p> <p>European SmartGrids Technology Platform (2006). <i>Vision and Strategy for Europe's Electricity Networks of the Future</i></p> <p>International Energy Agency (2011). <i>Technology Roadmap, Smart Grids</i>.</p> <p>International Energy Agency (2008). <i>World Energy Outlook</i>. OECD/IEA</p> <p>Faranghi, H. (2010). The Path of the Smart Grid, <i>IEEE power and energy magazine</i>, 8(1), 18-28</p> <p>Wakefield, M., Nowaczyk, J., and Handley, J. (2014). From Research to Action: Communication Research and Actions to Enable the Future Electric Power System. <i>Electric Energy T&amp;D</i>, 97, 772</p> <p>Brown, M. and Zhou, S. (2012) Sustainable Smart Grids, Emergence of a Policy Framework. <i>Encyclopedia of Sustainability Science and Technology</i>, 10.1007/978-1-4419-0851-3_767</p> <p>Dolezilek, D. and Schweitzer, S. (2009). <i>Practical Applications of Smart Grid Technologies</i>. Schweitzer Engineering Laboratories</p>
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**MODULU 2 (INTRAPRENDITORIJA ĦADRA) - HANDOUT**

<b>Introduzzjoni</b>	<p>L-intraprenditorija hija l-kapaċità u r-rieda li tiżviluppa, torganizza u tmexxi negozju flimkien ma' xi wieħed mir-riskji tiegħu sabiex tagħmel profitt. L-iktar eżempju ovvju tal-intraprenditorija huwa l-bidu ta' negozji ġodda. Fl-ekonomija, l-intraprenditorija flimkien mal-art, ix-xogħol, ir-riżorsi naturali u l-kapital jistgħu jipproduċu profitt. L-ispirtu intraprenditorjali huwa kkaratterizzat mill-innovazzjoni u t-teħid tar-riskji, u huwa parti essenzjali tal-kapaċità ta' nazzjon li jirnexxi fis-suq globali dejjem jinbidel u dejjem aktar kompetittiv.</p> <p>Negozji ħodor huma negozji li huma impenjati li jnaqqsu l-impatt tagħhom fuq l-ambjent jew jiffokaw fuq is-sostenibbiltà.</p> <p>Is-sostenibbiltà tinkludi mhux biss il-konsiderazzjoni ta' kwistjonijiet ambjentali, iżda tinkludi kwistjonijiet soċjali, ekonomiċi u ambjentali, magħrufa wkoll bħala t-tliet pilastri tas-sostenibbiltà.</p> <p>Strategija għall-implimentazzjoni ta' valuri bħad-drittijiet tal-bniedem, l-ugwaljanza soċjali u naturalment ħarsien ambjentali, fin-negozju huwa l-kunċett tar-Responsabilità Soċjali Korporattiva (Corporate Social Responsibility - CSR).</p>
<b>Deskrizzjoni</b>	<p><b>sezzjonijiet e -learning dwar:</b></p> <ol style="list-style-type: none"> <li>1. X'inhi l-intraprenditorija: introduzzjoni</li> <li>2. Prinċipji tas-CSR, pilastri ambjentali u x'inhu negozju aħdar?</li> <li>3. Il-ħolqien u analizi ta' idea għal negozju aħdar</li> <li>4. Inti lest biex tibda n-negozju aħdar tiegħek?</li> <li>5. Pjan ta' kummerċjalizzazzjoni</li> <li>6. Konformi mar-regoli u r-regolamenti li tibda negozju aħdar tiegħek</li> <li>7. Bidu ta' negozju aħdar - pjan PDCA ta' negozju</li> </ol> <p><b>Assenjament 1:</b> Identifikazzjoni ta' prassi tajba fil-qasam tat-Green Business u elaborazzjoni fuq il-prinċipji tas-CSR ambjentali li huma jindirizzaw, kif ukoll il-prinċipji ta' l-intraprenditorija</p> <p><b>Assenjament 2:</b> Żvilupp ta' pjan ta' marketing, skond il-prattika tajba identifikat f'Assenjament 1</p> <p><b>Assenjament 3:</b> Elaborazzjoni ta' pjan ta' negozju għal idea tan-negozju aħdar.</p>
<b>Referenzi</b>	<ul style="list-style-type: none"> <li>• Devine, Diane/Mizusawa, Lee/Gittell, Ross 2012: Sustainable business marketing.</li> <li>• Pascual, Oriol/van Klink, Arjen/ Rozo/Grisales, Julio Andrés: Create Impact! Handbook for Sustainable Entrepreneurship. Envia-innovators in sustainability 2011</li> <li>• Pott, Oliver/Pott, Andre (2012): Entrepreneurship: Unternehmensgründung, unternehmerisches Handeln und rechtliche Aspekte. Springer: Berlin, Heidelberg.</li> </ul> <p><b>Online references</b></p> <ul style="list-style-type: none"> <li>• <a href="http://2012books.lardbucket.org/books/sustainable-business-cases/s10-sustainable-business-marketing.html">http://2012books.lardbucket.org/books/sustainable-business-cases/s10-sustainable-business-marketing.html</a> 09.06.2015]</li> <li>• <a href="http://www.businessdictionary.com/definition/entrepreneurship.html">http://www.businessdictionary.com/definition/entrepreneurship.html</a></li> </ul>





	<p>[08.06.2015]</p> <ul style="list-style-type: none"> <li>• <a href="http://www.businessdictionary.com/definition/green-business.html">http://www.businessdictionary.com/definition/green-business.html</a> [08.06.2015]</li> <li>• <a href="https://www.changemakers.com/g20media/greenSMEs">https://www.changemakers.com/g20media/greenSMEs</a> [08.06.2015]</li> <li>• <a href="http://ec.europa.eu/enterprise/policies/sustainable-business/corporate-socialresponsibility/index_en.htm">http://ec.europa.eu/enterprise/policies/sustainable-business/corporate-socialresponsibility/index_en.htm</a> [09.06.2015]</li> <li>• <a href="http://www.greenonlinebusiness.net/starting-a-green-business/">http://www.greenonlinebusiness.net/starting-a-green-business/</a> [09.06.2015]</li> <li>• Green paper - Promoting a European framework for corporate social responsibility. /* COM/2001/0366 final */. In: <a href="http://eur-lex.europa.eu/legalcontent/EN/TXT/?uri=CELEX:52001DC0366">http://eur-lex.europa.eu/legalcontent/EN/TXT/?uri=CELEX:52001DC0366</a> [07.06.2015]</li> <li>• <a href="http://oin.at/_publikationen/PublikationenALT/Fachartikel/Strigl%2004%20cs%20in%20austria.pdf">http://oin.at/_publikationen/PublikationenALT/Fachartikel/Strigl%2004%20cs%20in%20austria.pdf</a> [07.06.2015]</li> <li>• <a href="http://www.sustainability4success.com/plan-do-check-act.html">http://www.sustainability4success.com/plan-do-check-act.html</a> [08.06.2015]</li> <li>• <a href="http://sustainabletx.org/.../116-green-business-plan-guide">sustainabletx.org/.../116-green-business-plan-guide</a> [07.06.2015]</li> <li>• <a href="http://www.wbcsd.ch/eurint/eeei.htm">http://www.wbcsd.ch/eurint/eeei.htm</a> [07.06.2015]</li> </ul>
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**MODULU 3 (SETTURI TA' APPLIKAZZJONI TA' INTRAPRENDITORIJA ĦADRA) – HANDOUT**

<b>Introduzzjoni</b>	<p>L-intraprenditorija ħadra tirreferi għan-negozji li għandhom fil-mira tagħhom prodotti, servizzi jew proċessi fejn l-għan aħħari jkun li jibbenefika l-ambjent. It-terminu "aħdar" tiffoka fuq aspetti varji, bħall-ħolqien u l-konsum tal-enerġija mingħajr ma jniġġes l-ambjent, l-integrazzjoni ta' sorsi ta' enerġija rinnovabbli u tnaqqis tal-użu tal-fjuwils fossili u l-ġestjoni tal-enerġija b'mod effiċjenti kemm jista' jkun lejn konsum sostenibbli u l-isfruttament ta' enerġija prodotta fil-livell massimu filwaqt li jimplimenta proċessi ta' skart minimu.</p> <p>L-intraprenditorija ħadra diġà sabet il-post tagħha u bħalissa qegħda tespandi fis-setturi differenti, bħal bliet u t-trasport intelligenti. Il-motivazzjoni, l-ambitu u l-impatt ta' dan l-approċċ aħdar ivarja matul dawn l-oqsma, fejn bosta ICTs qed jaħdmu sabiex jinkiseb użu effiċjenti u sostenibbli tal-enerġija.</p> <p>Fid-dawl ta' dan kollu, dan il-modulu għandu l-għan li jipprovdi ħarsa ġenerali ta' xi setturi ewlenin ta' applikazzjoni ta' intraprenditorija ħadra flimkien mal-karatteristiċi bażiċi tal-implimentazzjoni ta' enerġija intelligenti.</p>
<b>Deskrizzjoni</b>	<p><b>Lecture:</b> Preżentazzjoni tat-tliet setturi ta' applikazzjoni ta' intraprenditorija ħadra ewlenin, jiġifieri enerġija intelligenti tal-bliet, bini u t-trasport. Deskrizzjoni tal-karatteristiċi ewlenin, l-isfidi u l-opportunitajiet ta' kull settur u għarfien fil-mod kif l-enerġija intelligenti tiġi implimentata sabiex jinkisbu soluzzjonijiet ekoloġiċi.</p> <p><b>Assenjament 1:</b> L-istudent mitlub jelabora fuq soluzzjoni ħadra għall-lokal li jgħix fih, jiddeskrivi l-motivazzjoni, l-oġġettivi, l-impatt mistenni u applikazzjonijiet ICT tal-proposta tagħhom.</p> <p><b>Assenjament 2:</b> L-istudent mitlub jiddeskrivi l-kunċett ta' sistemi HVAC, il-komponenti bażiċi tagħhom u t-teknoloġiji ewlenin użati fit-twettiq tagħhom.</p> <p><b>Assenjament 3:</b> L-istudent mitlub jipprovdi ħarsa ġenerali tal-infrastruttura eżistenti għall-iċċargjar ta' vetturi elettriċi u jiddeskrivi l-perspettivi tal-evoluzzjoni tagħhom.</p>
<b>Referenzi</b>	<p>Dincer, I. and Rosen, M. A. (2007). Exergy: energy, environment and sustainable development, Elsevier, Oxford, UK</p> <p>Rosen, M.A., Le, M.N., and Dincer, I. (2005). Efficiency analysis of a cogeneration and district energy system. Appl Thermal Eng, 25, 147–159</p> <p>Gustafsson, J., Delsing, J. , and Deventer, J. (2010). Improved district heating substation efficiency with a new control strategy Appl Energy, 87, 1996–2004</p> <p>Frost and Sullivan (2011). The Key to Cost-Effective and Sustainable Buildings: Intelligent Energy.</p> <p>European Commission (2010). 'EU energy and Transport in Figures -</p>



	<p>Statistical Pocket Book 2010'.</p> <p>Institute for building efficiency (<a href="http://www.institutebe.com/">http://www.institutebe.com/</a>)  <a href="http://www.accenture.com/SiteCollectionDocuments/PDF/Accenture-Energy-Smart-Buildings.pdf">http://www.accenture.com/SiteCollectionDocuments/PDF/Accenture-Energy-Smart-Buildings.pdf</a></p> <p>Grob, G.R. (2009). Future Transportation with Smart Grids &amp; Sustainable Energy SYSTEMICS, CYBERNETICS AND INFORMATICS, 7(5), 50-54</p>
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Modulu 4 (STUDJU TA' KAŻ TA' INTRAPRENDITORIJA ĦADRA) - HANDOUT

<b>Introduzzjoni</b>	"Philips" hija impriża ewlenija fid-dinja kollha li topera fl-oqsma ta' kura tas-saħħa, stil ta' ħajja u dawl. L-eżempju deskritt hawn taħt huwa l-mudell tan-negozju fil-kuntest ta' Philips Lighting. L-għan huwa li tiġġenera għarfien ta' kif jaħdem il-mudell, kif qed jiġi implimentat fil-kumpanija u x'impatti għandu għall-klijent, il-kumpanija u l-ambjent.
<b>Deskrizzjoni</b>	<p>Lecture:</p> <p>Fl-istudju tal-każ is-servizz ta' dawl ambjentali tal-kumpanija Philips huwa deskritt, iffokat fuq il-mudell kummerċjali tagħha fir-rigward tal-effiċjenza fl-enerġija, ir-riċiklaġġ u r-relazzjonijiet fit-tul mal-klijent.</p> <p>F'dan il-mudell tan-negozju l-kumpanija tipproduċi, tinstalla, tipperpetwa, tiġbor lura u, sa ċertu punt, tagħmel użu mill-ġdid tal-materjali mis-sistema tad-dawl. Il-klijent iħallas biss ħlas għal servizz u għall-funzjoni fuq perjodu miftiehem bil-kwalità mixtieqa. Dan il-mudell, għandu tliet aspetti differenti minn mudell ta' negozju tradizzjonali:</p> <ol style="list-style-type: none"> <li>1) Il-klijent mhux biss jirċievi prodott, imma servizz;</li> <li>2) Ir-relazzjoni bejn klijent u l-kumpanija tinbidel minn relazzjoni ta' bejgħ għal sħubija fdati ta' servizz li tipprovdi s-sistemi tad-dawl; u</li> <li>3) Il-mudell ta' negozju għandha effett fuq it-trasferiment ta' fondi, li tbiddel minn ħlas selettiv lejn skema ta' pagament kontinwu.</li> </ol> <p>Laboratorju:</p> <p>L-istudenti huma mistiedna jiddiskutu s-segwenti domandi individwalment jew fi gruppi:</p> <ul style="list-style-type: none"> <li>• Liema aspetti tan-negozju jinbidlu permezz tal-implimentazzjoni tal-mudell? Spjega l-isfidi ewlenin u kif dawn ġew indirizzati.</li> <li>• Hemm sitwazzjoni fejn jirbaħ kulhadd u għaliex iva / le?</li> <li>• Kif tista' tiddeskrivi l-motivazzjoni għall-implimentazzjoni ta' dan il-mudell u liema huma d-differenzi possibbli meta mqabbel ma' start-up SMEs?</li> <li>• Spjega xi jrid jagħmel intraprenditur biex ikollu suċċess fin-negozju filwaqt li jibdel tal-mudell tan-negozju.</li> </ul> <p>Assenjament:</p> <p>Žur l-websajt tal-kumpanija u identifika l-indikaturi tal-valuri ekoloġiċi u soċjali u kif il-mudell ta' negozju jirrifletti dawk il-valuri. Huwa wkoll meħtieġ biex issir taf liema oqsma ekoloġiċi jkopru dawn il-miżuri u liema huma ż-żoni tal-kumpanija li dawn jaffettwaw.</p>
<b>Referenzi</b>	<p><b>APA style:</b></p> <p>Henriksen, Kristian/Bjerre, Markus/Damgaard Grann, Emil/Lindahl, Mattias/Suortti, Tuomo/ Friðriksson, Karl/ Mühlbradt, Tor/ Sand Henrik (2012): Green business model innovation. Business case study compendium. Nordic Innovation report. Oslo: Nordic Innovation</p>

### KORS III. INTRAPRENDITORIJA - ENERĠIJA INTELLIĠENTI

#### MODULU 1 (ENERĠIJA INTELLIĠENTI) – HANDOUT

<b>Introduzzjoni</b>	<p>Is-settur tal-enerġija qed jinbidel u jiffoka fuq sorsi ta' enerġija rinnovabbli, filwaqt li jintegra dejjem aktar teknoloġiji diġitali matul l-istadji kollha tal-katina tal-enerġija. Matul dawn l-aħħar għaxar snin, il-kunċetti ta' "Enerġija Intelliġenti" u "Smart Grid" ġew implimentati b'mod wiesa', sabiex jipprovdu infrastruttura qawwa u avvanzata. Din il-bidla se tiffaċilita l-użu aktar sostenibbli u effettiv ta' enerġija, il-partecipazzjoni attiva tal-konsumaturi u integrazzjoni akbar ta' sorsi tal-enerġija rinnovabbli.</p> <p>Mibni fuq dan il-qafas, dan il-modulu għandu l-għan li jiffamiljarizza l-istudenti bl-istatus attwali ta' enerġija u jintroduċi l-elementi fundamentali tal-kunċett tal-Enerġija Intelliġenti. Il-modulu mbagħad jipprezenta aspetti varji ta' Smart Grid u jipprovdi paragun bejn grids tradizzjonali u dawk intelliġenti biex jgħin lill-istudenti jidentifikaw l-karatteristiċi fundamentali bżonnjużi fil-mixja lejn grid aktar intelliġenti. Skop prinċipali ta' dan il-modulu hu li jipprovdi informazzjoni dwar l-arkitettura, il-komponenti u l-oqsma teknoloġiċi ta' grid intelliġenti, sabiex l-istudenti jkunu kompetenti fit-tfassil ta' grids intelliġenti u fl-għażla l-aktar teknoloġiji adegwati għat-twettiq tagħhom. Fl-aħħarnett, bosta inizjattivi Ewropej u internazzjonali fil-qasam tal-Enerġija Intelliġenti huma diskussi fil-qosor.</p>
<b>Deskrizzjoni</b>	<p><b>Lecture:</b> Introduzzjoni għall-enerġija li tiffoka fuq sorsi ta' enerġija, l-istatus globali tal-enerġija attwali, il-projezzjonijiet u l-prospetti tal-istatus tal-enerġija fil-ġejjieni, kif ukoll il-problemi u l-isfidi tal-enerġija. Il-kunċett u l-impatt mistenni ta' Enerġija Intelliġenti huma deskritti. Il-grid tal-elettriku eżistenti hija pprezentata flimkien mal-limitazzjonijiet tagħha u l-ħtieġa li jiġi adottat approċċ aktar "intelliġenti". Deskrizzjoni dettaljata tal-prinċipji fundamentali ta' grids intelliġenti, il-karatteristiċi tagħhom, l-arkitettura u l-mudell konċettwali, komponenti maġġuri, kif ukoll l-oqsma teknoloġiċi li qed jiġu implimentati tul il-katina ta' enerġija fi ħdan grid intelliġenti. Diskussjoni tal-obiettivi tal-grid intelliġenti, tal-fatturi ta' suċċess ewlenin u l-benefiċċji fuq il-grid tradizzjonali. Deskrizzjoni qasira tal-inizjattivi Ewropej u internazzjonali relattivi.</p> <p><b>Assenjament 1:</b> L-istudenti jridu jellaboraw fuq lista estiża tas-sewwieqa li jwasslu għall-adozzjoni tal-kunċett ta' Enerġija Intelliġenti, u ieħor li tenfasizza l-impatt tiegħu, ikklassifikat fl-oqsma varji (eż ambjent, is-soċjetà, l-ekonomija, ġestjoni tal-enerġija, eċċ)</p> <p><b>Assenjament 2:</b> L-istudenti jridu jiktbu l-opportunitajiet madwar grid intelliġenti fil-pajjiżi tagħhom.</p> <p><b>Assenjament 3:</b> Ibbażat fuq l-arkitettura ġenerika pprezentata minn grid intelliġenti u l-għarfien tagħhom fuq settings u l-ħtiġijiet universitarji, l-istudenti se jkunu mitluba li jiddisinjaw arkitettura ta' grid intelliġenti għal kampus ta' università b'integrazzjoni tar-riżorsi ta' enerġija rinnovabbli u jiddefinixxu politika ta' ġestjoni tal-enerġija sabiex tinkiseb is-sostenibbiltà u timmassimizza l-effiċjenza fil-konsum tal-enerġija.</p>
<b>Referenzi</b>	<p>U.S. Energy Information Administration (2014). <i>International Energy Outlook</i>, Report, DOE-EIA-0484(2014)</p> <p>European SmartGrids Technology Platform (2006). <i>Vision and Strategy for</i></p>

	<p><i>Europe's Electricity Networks of the Future</i></p> <p>International Energy Agency (2011). <i>Technology Roadmap, Smart Grids</i>.</p> <p>International Energy Agency (2008). <i>World Energy Outlook</i>. OECD/IEA</p> <p>Faranghi, H. (2010). The Path of the Smart Grid, <i>IEEE power and energy magazine</i>, 8(1), 18-28</p> <p>Wakefield, M., Nowaczyk, J., and Handley, J. (2014). From Research to Action: Communication Research and Actions to Enable the Future Electric Power System. <i>Electric Energy T&amp;D</i>, 97, 772</p> <p>Brown, M. and Zhou, S. (2012) Sustainable Smart Grids, Emergence of a Policy Framework. <i>Encyclopedia of Sustainability Science and Technology</i>, 10.1007/978-1-4419-0851-3_767</p> <p>Dolezilek, D. and Schweitzer, S. (2009). <i>Practical Applications of Smart Grid Technologies</i>. Schweitzer Engineering Laboratories</p>
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***EPOQUE: PORTAFOLL AMBJENTALI GHALL-KWALITÀ FL-  
EDUKAZZJONI UNIVERSITARJA  
ÉPOQUE: ENVIRONMENTAL PORTFOLIO FOR QUALITY IN  
UNIVERSITY EDUCATION***

## **KORS III / COURSE III**

**INTRAPRENDITORIJA - ENERĠJA INTELLIGENT  
ENTREPRENEURSHIP – INTELLIGENT ENERGY**

## **MODULU / MODULE 1**

**ENERĠJA INTELLIGENTI / INTELLIGENT ENERGY**



# OUTLINE

**TOPIC 1: Introduction to Intelligent Energy**

**TOPIC 2: The Smart Grid Concept**

**TOPIC 3: Smart Grid Components &  
Technologies**

*The teaching language at the University of Malta is English and therefore the course content is being presented in the English language to be used by any Maltese students/learners.*

*Il-lingwa tat-tagħlim fl-Università ta' Malta hija l-Ingliż u għalhekk il-kontenut tal-kors qed jiġi ppreżentat bil-lingwa Ingliża għal-użu tal-istudenti Maltin.*

# OUTLINE

**TOPIC 1: Introduction to Intelligent Energy**

TOPIC 2: The Smart Grid Concept

TOPIC 3: Smart Grid Components &  
Technologies

# ENERGY TODAY

- Industry, transport and buildings (residential and commercial) are the main energy sectors
- Energy needs are currently met mainly from fossil fuels accounting for about 82% of the world's primary energy use in 2011
- Gradual but rather slow integration of renewable energy - fossil fuel consumption's increase rate remains bigger
- Energy consumption is constantly growing due to industrialization and increasing wealth of growing markets and the growing population trend

# ENERGY SOURCES

## ■ Fossil

- Coal
- Petroleum
- Natural gas

## ■ Nuclear

## ■ Renewable

- Hydropower
- Wind
- Solar
- Geothermal



# RENEWABLE ENERGY

Can be found almost everywhere – fossil fuels are found in very small areas



Environment friendly tackling climate change and global warming concerns



It is constantly and naturally replenished as opposed to conventional fuels



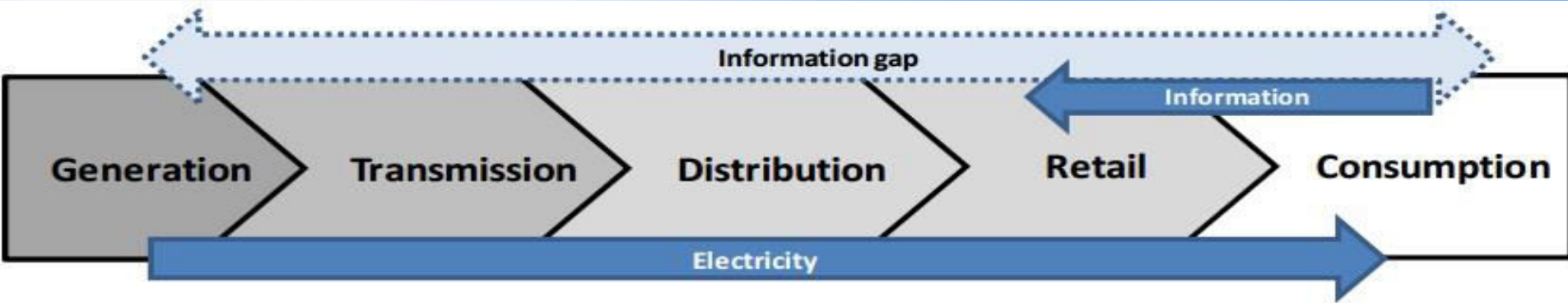
Wind, solar, biomass, hydro, geothermal energy the main renewable sources



The terms “clear energy” and “green energy” are used alternatively



# ENERGY VALUE CHAIN



- **Generation** is conversion of primary energy sources to electricity
- **Transmission** is the first step in the transportation of energy, encompassing high voltage transmission lines
- **Distribution** refers to power delivery to the point of consumption
- **Retail** and value-added services refer to the commercialization of electricity to final customers
- **Consumption** covers all electricity-using activities that take place on the customer's account or premises

# WORLD ENERGY PROJECTIONS

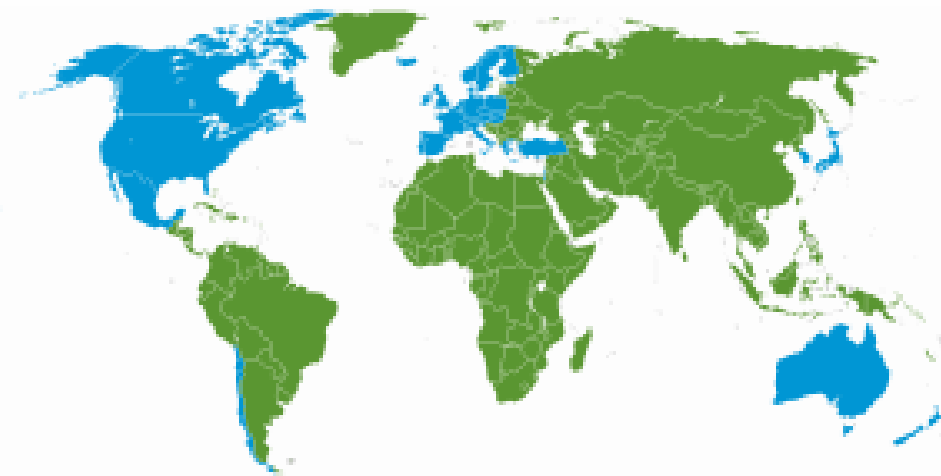
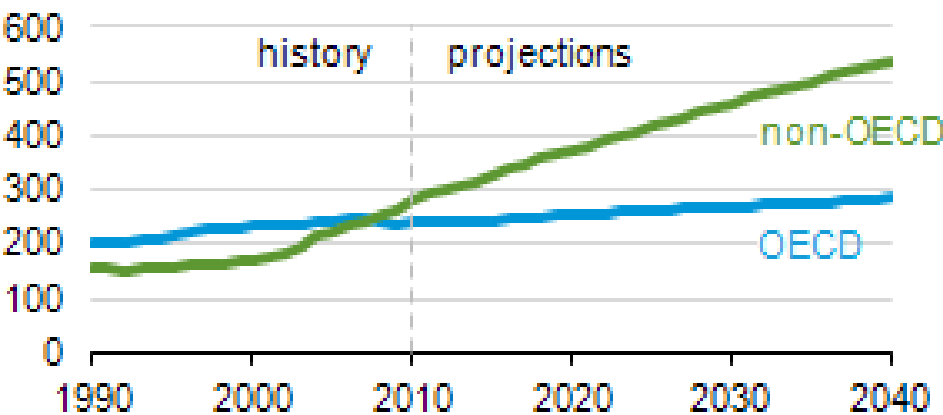
- World energy consumption will grow by 56% between 2010 and 2040
- Renewable energy and nuclear power will each increase 2.5% per year
- Fossil fuels will continue to supply nearly 80% of world energy use through 2040
- Carbon dioxide emissions will have in 2040 a 46% increase from 2010



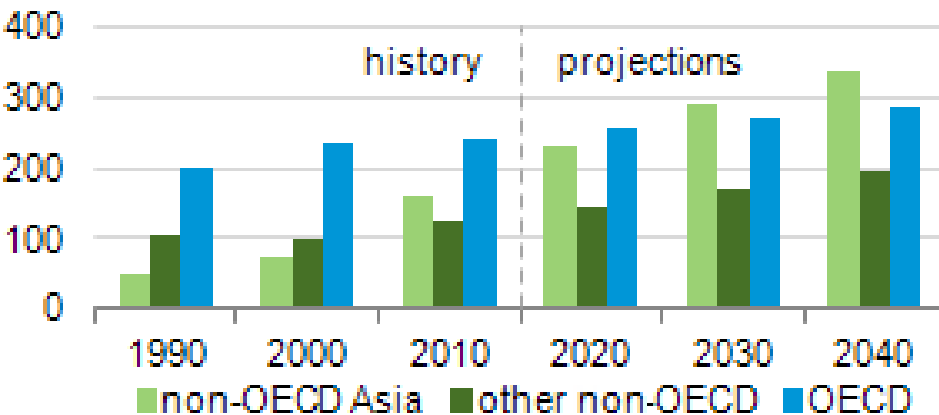
# CONSUMPTION PROJECTIONS

Source: U.S. Energy Information Administration, International Energy Outlook 2013

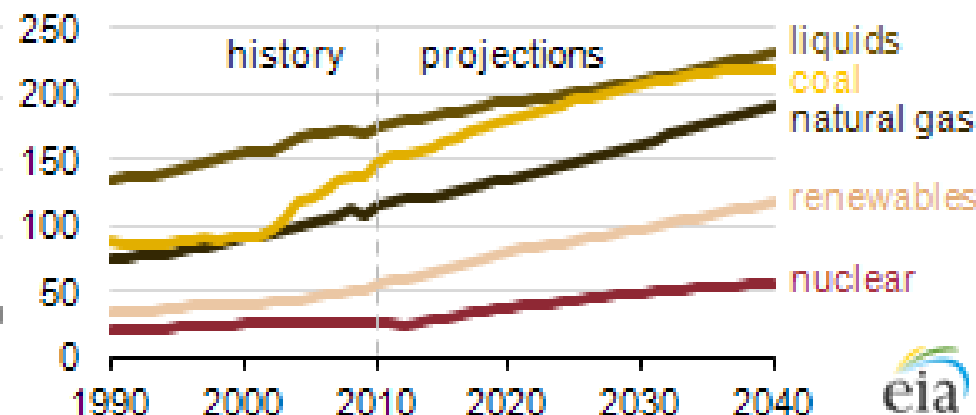
World energy consumption  
quadrillion Btu



World energy consumption  
quadrillion Btu



World energy consumption by fuel  
quadrillion Btu



OECD: Organization for Economic Cooperation and Development

# PROBLEMS

- Costs rise and demands grow faster than supply putting pressure on global fossil fuel mining
- Fossil fuels still represent the cheapest energy means
- High environmental degradation
- Existing energy systems (buildings, electric grids, legal issues) are not flexible in integrating renewable sources
- Lack of common ground in energy policy hindering cohesive energy planning
- Several factors (economic, political, etc.) prevent the fast and wide deployment of renewable energy sources

# CHALLENGES

- Evolvment to meet agreed environmental and geopolitical goals
- Sustainable and more efficient production, distribution, and consumption of energy
- Smooth integration of renewable energy sources addressing the introduced intermittency and fluctuation
- Effective and affordable solutions for managing energy consumption and costs
- **Emergence of the intelligent energy concept**

# INTELLIGENT ENERGY

Integration of digital intelligence by implementing appropriate ICTs throughout the production, transmission, distribution and management processes of the energy system



# OUTLINE

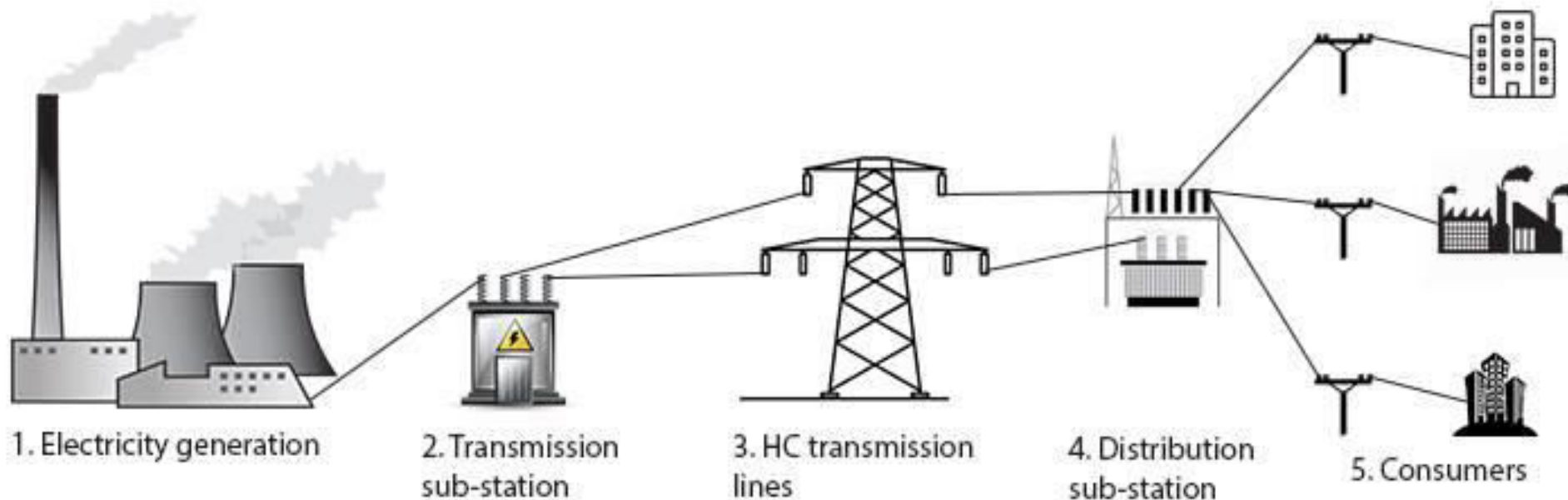
TOPIC 1: Introduction to Intelligent Energy

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# EXISTING ELECTRICITY/POWER GRID

- It is a network delivering electricity from suppliers to consumers
  - Electricity providers running **power** generating **stations** (1)
  - **Sub-stations** transforming voltage upwards and downwards (2, 4)
  - **Transmission lines** to carry high voltage electrical power (3)
  - **Distribution lines** to connect consumers with the electricity grid (5)





# CURRENT GRID'S LIMITATION

- Ageing infrastructure without recent evolvments – slow response times due to mechanical parts
- Energy efficiency, environmental issues and consumers' needs are not central in its design
- Very limited visibility and flexibility
- Lack of situation-awareness and automated analyses of operational conditions
- One-way communication between supply and demand
- Inefficient power supply security
- Inability to store generated energy



# DRIVERS FOR AN “INTELLIGENT” APPROACH

- Electricity demands will rise heavily (heat pumps, electric vehicles) and current grid has almost reached its limit
- Flexible architectures to integrate new energy sources and technologies for energy storage and balancing demand with supply
- Renewable energy sources (especially wind) are fluctuating and require enhanced management and control capabilities of the energy system
- Need to provide energy storage capabilities, improve the security of supply and to lower carbon emissions

# SMART GRID

*“A smart grid is an electricity network that can intelligently integrate the actions of all users connected to it - generators, consumers and those that do both – in order to efficiently deliver sustainable, economic and secure electricity supplies.”*

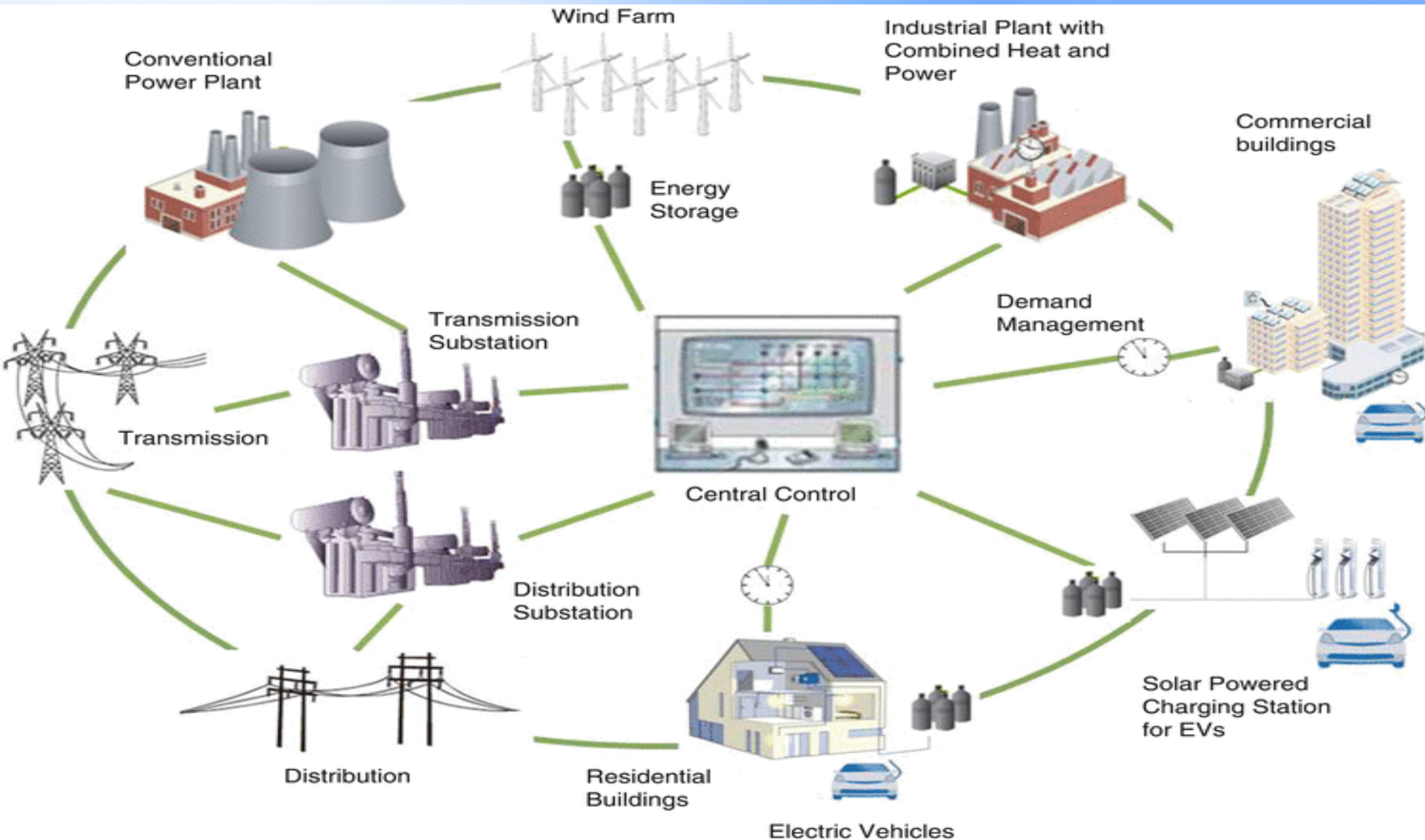


# DEFINING SMART GRID

A smart grid is an electricity network that uses digital and other advanced technologies to monitor and manage the transport of electricity from all generation sources to meet the varying electricity demands of end-users.

Smart grids co-ordinate the needs and capabilities of all generators, grid operators, end-users and electricity market stakeholders to operate all parts of the system as efficiently as possible, minimizing costs and environmental impacts while maximizing system reliability, resilience and stability.

# SMART GRID ARCHITECTURE



# INTELLIGENT VS CONVENTIONAL GRID

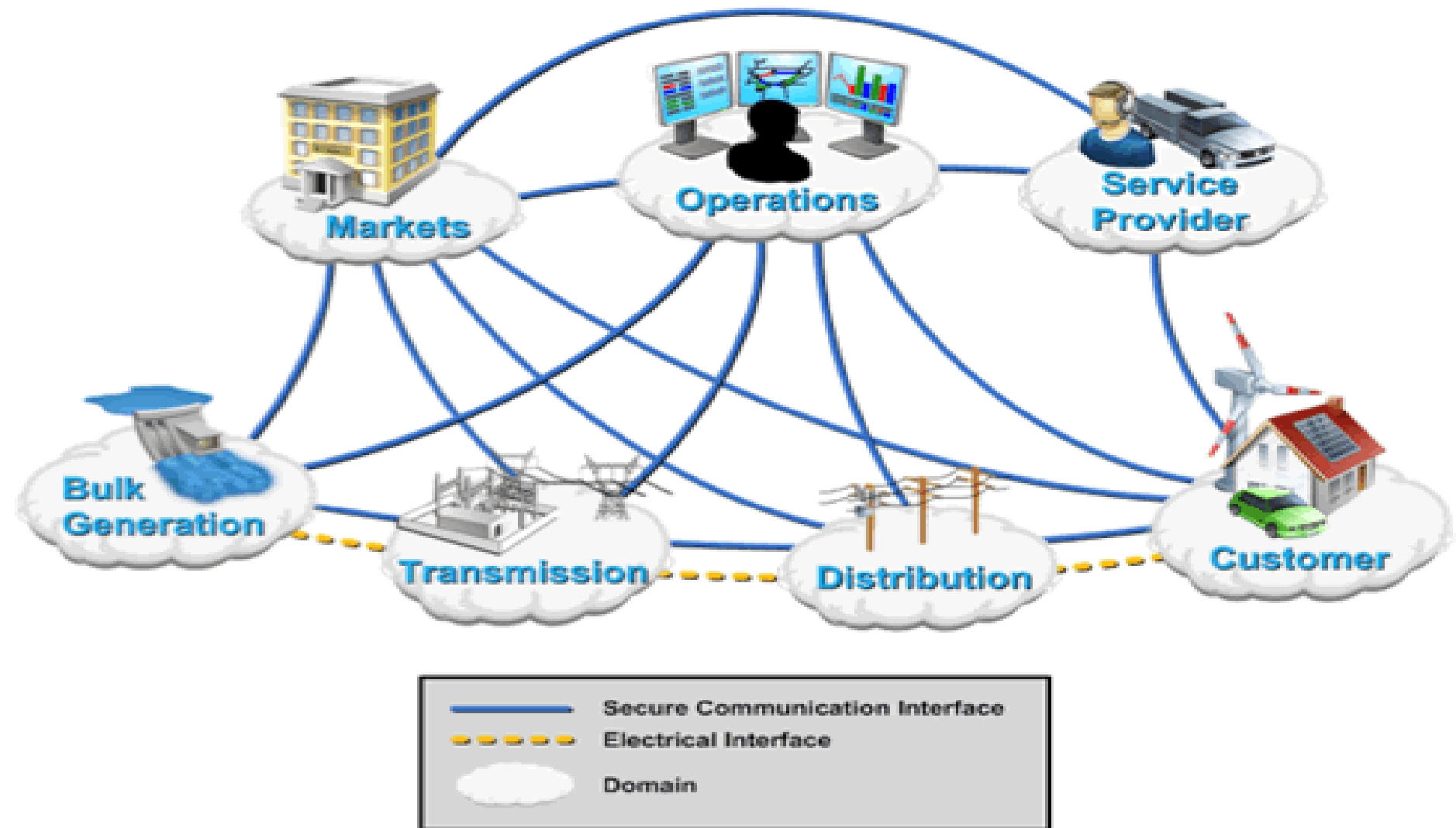
Existing grid	Intelligent grid
Electromechanical	Digital
One-way communication	Two-way communication
Centralised generation	Distributed generation
Hierarchical	Network
Few sensors	Sensors throughout
Blind	Self-monitoring
Manual restoration	Self-healing
Failures and black-outs	Adaptive and islanding
Manual check/test	Remote check/test
Limited control	Pervasive control
Few customer choices	Many customer choices



# SMART GRID'S OBJECTIVES

- Overcome the limits on the development of distributed generation and storage
- Increase efficiency of the electricity grid and reduce electricity grid wastage
- Ensure interoperability, robustness and security of supply even under the instance of emergency issues including self-healing abilities
- Provide accessibility for all the users to a liberalized market
- Reduce the impact of environmental consequences of electricity production and delivery

# SMART GRID CONCEPTUAL MODEL





# SMART GRID DOMAINS & ACTORS

Domain	Actors in the Domain
Customers	The end users of electricity. May also store, and manage the use of energy. Traditionally, three customer types are discussed, each with its own domain: residential, commercial, and industrial.
Markets	The operators and participants in electricity markets.
Service Providers	The organizations providing services to electrical customers and utilities.
Operations	The managers of the movement of electricity.
Bulk Generation	The generators of electricity in bulk quantities. May also store energy for later distribution.
Transmission	The carriers of bulk electricity over long distances. May also store and generate electricity.
Distribution	The distributors of electricity to and from customers. May also store and generate electricity.

# SMART GRID'S KEY SUCCESS FACTORS

Reliable – provides power dependably, warns for and withstands failures, takes timely corrective actions

Secure – resists to physical and cyber attacks and it is less vulnerable to natural disasters

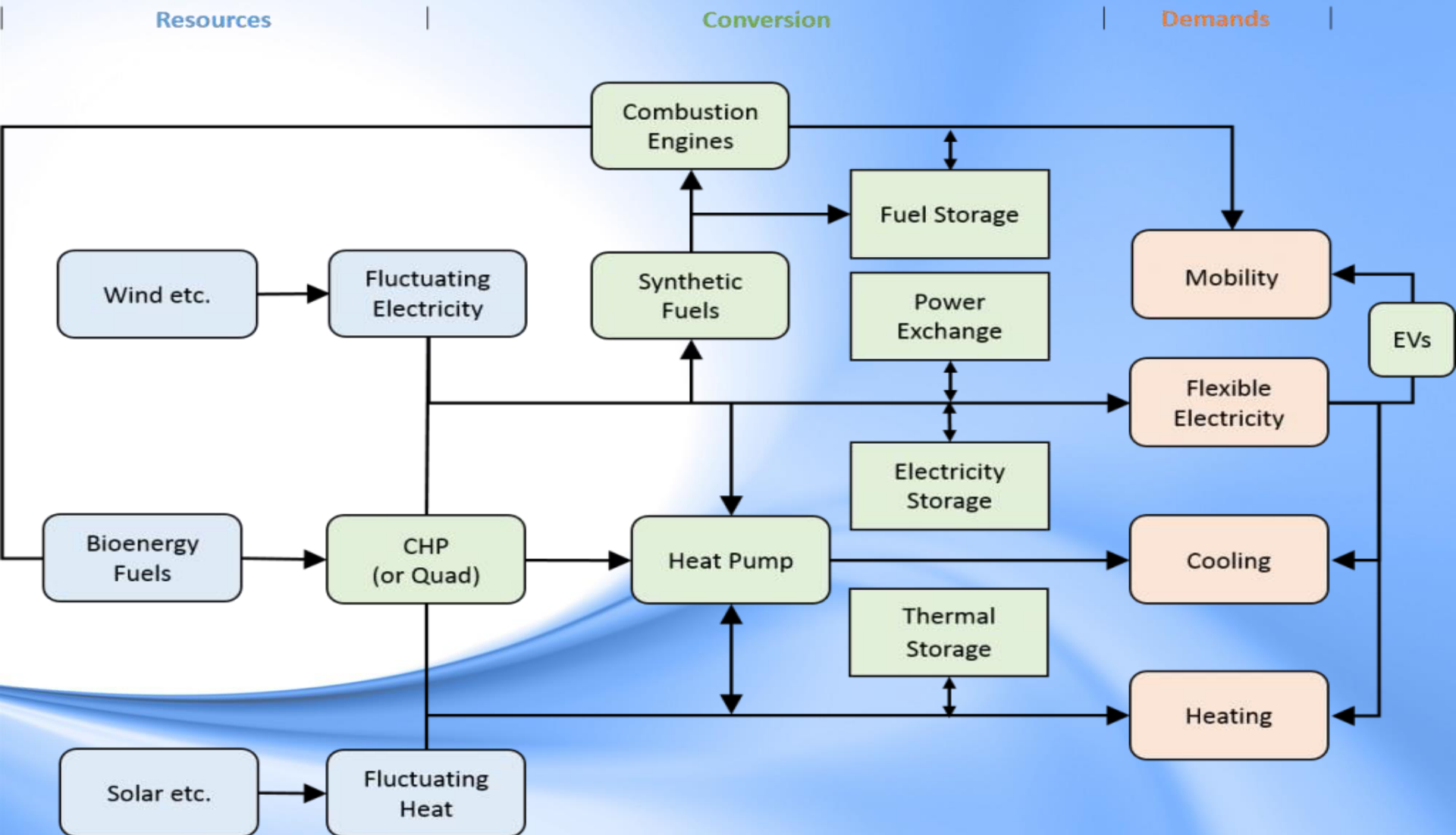
Economic – fair prices and adequate supply

Efficient – cost control, reduced transmission and distribution losses, more efficient power production

Environmentally friendly – reduces environmental impacts in every part of the energy system

Safe – does no harm to the public or to grid workers

# INTELLIGENT ENERGY CHAIN



# SMART GRID'S DEFINING TRAITS

1. Operates resiliently to disturbances, physical attacks and natural disasters
2. Enabling active consumer participation in demand response
3. Providing power quality for the 21st century needs
4. Accommodating all generation and storage options
5. Enabling new products, services, and markets
6. Optimizing assets and operating efficiently

# SELF-HEALING GRID

A self-healing grid is expected to respond to threats, material failures, and other destabilizing influences by preventing or containing the spread of disturbances through:

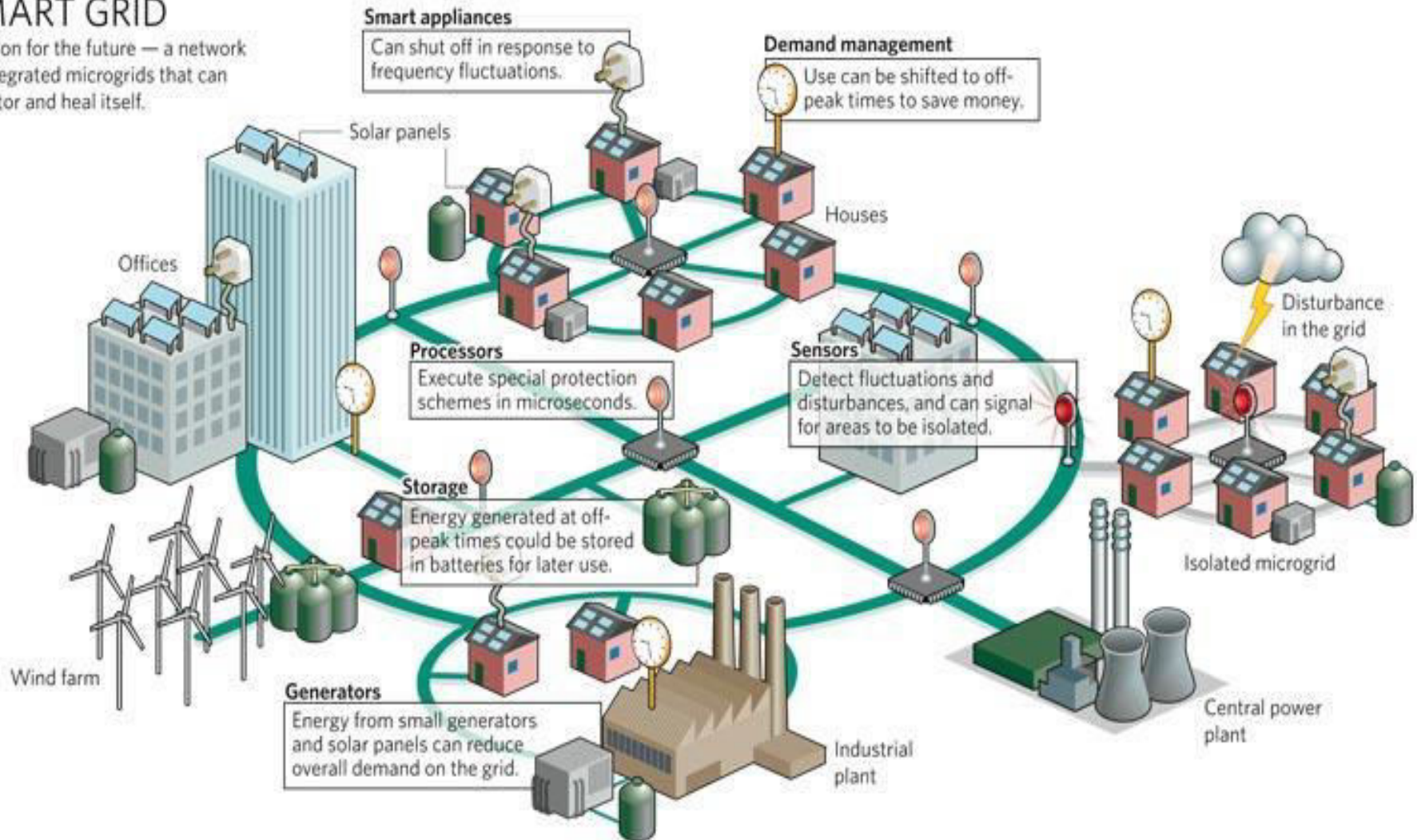
- Constantly monitoring its components and tunes itself to run at an optimum state
- Probabilistic risk assessments based on real-time measurements to identify potential components to fail
- Real-time contingency analyses to determine overall grid health
- Communications with local and remote devices to identify grid conditions and take control actions



# ISOLATING PROBLEMS

## SMART GRID

A vision for the future — a network of integrated microgrids that can monitor and heal itself.



# GRID RESILIENCY

- Reduced system vulnerability to physical or cyber attack
- Identification of threats and vulnerabilities – Enhanced critical threat information with closer ties between system operators and government
- Protecting the network – Implementation of security technologies, such as authorization, authentication, encryption and intrusion detection
- Inclusion of security risk in system planning – Anticipating the effects of a coordinated terrorist attack in system-wide planning



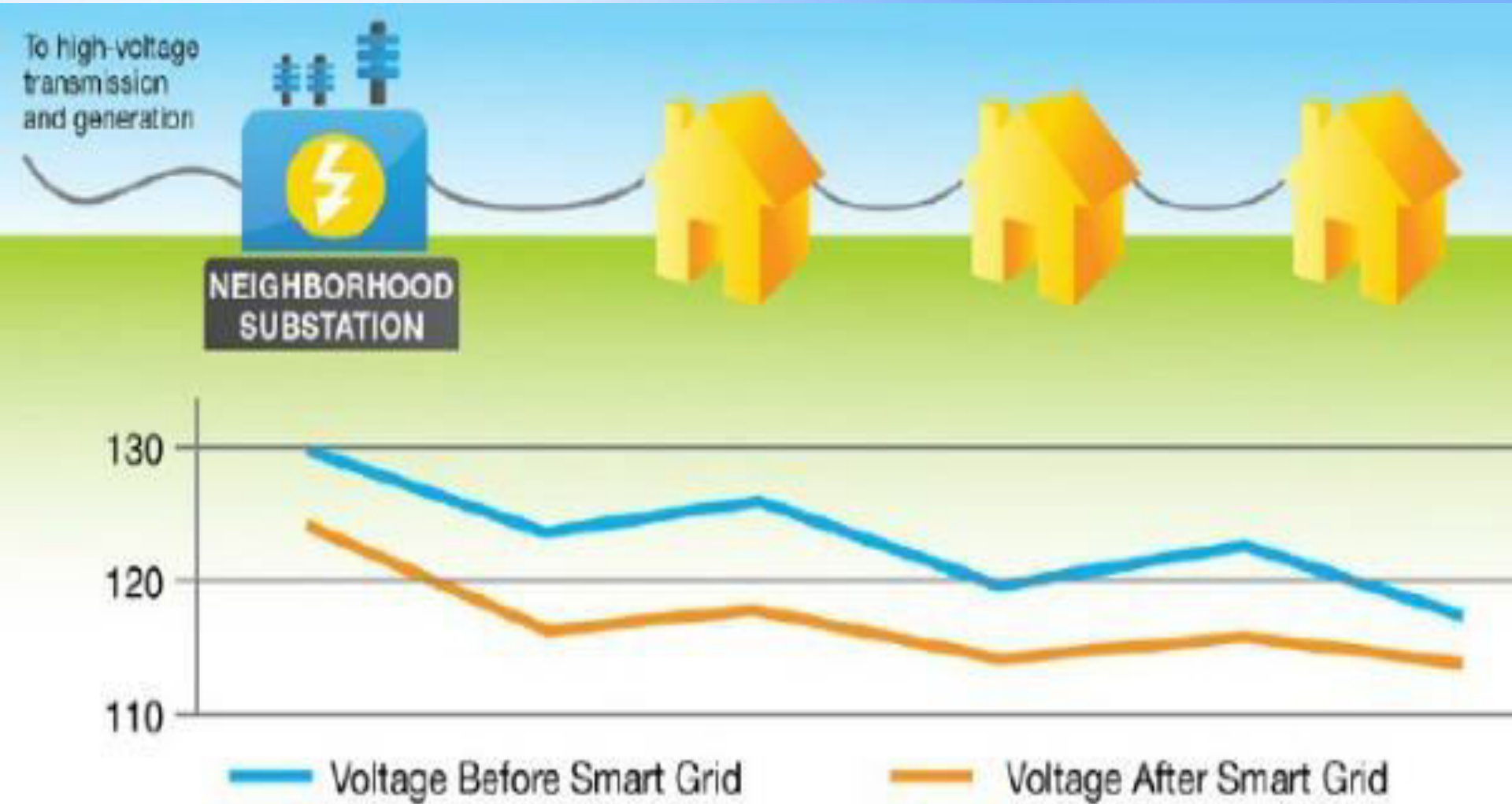
# ACTIVE CONSUMER PARTICIPATION

- Consumers choose when, where, and how much electricity they consume, generate, and store
- The new term “energy prosumer” is an energy market participant who both produces and consumes energy.
- System elements that inform the customer about the cost and value of their consumption in real time
- Improved control over home energy bills
- Incorporate their Plug-in Hybrid Electric Vehicles (PHEV) and Electric Vehicles (EV) into the home, office, etc.

# HIGH QUALITY POWER

- Technologies and devices on the distribution grid to manage the delivered voltage and power
- Voltage personalizes optimization for each consumer—supply based on actual consumer voltages
- Limiting/buffering voltage sags and surges on the grid
- Modern switching and advanced maintenance that help service providers prevent momentary power fluctuations from reaching users of digital devices
- Voltage imbalances reported by networked meters to service providers for immediate repair

# HIGH QUALITY POWER

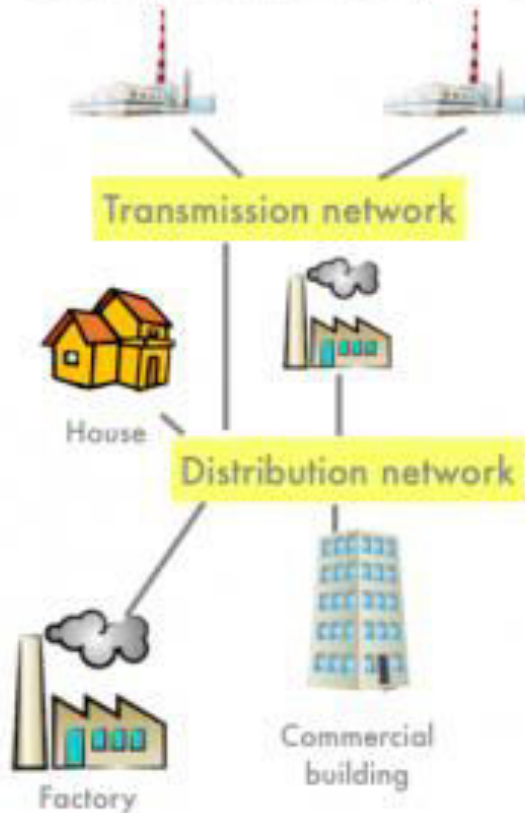


# MULTIPLE GENERATION & STORAGE OPTIONS

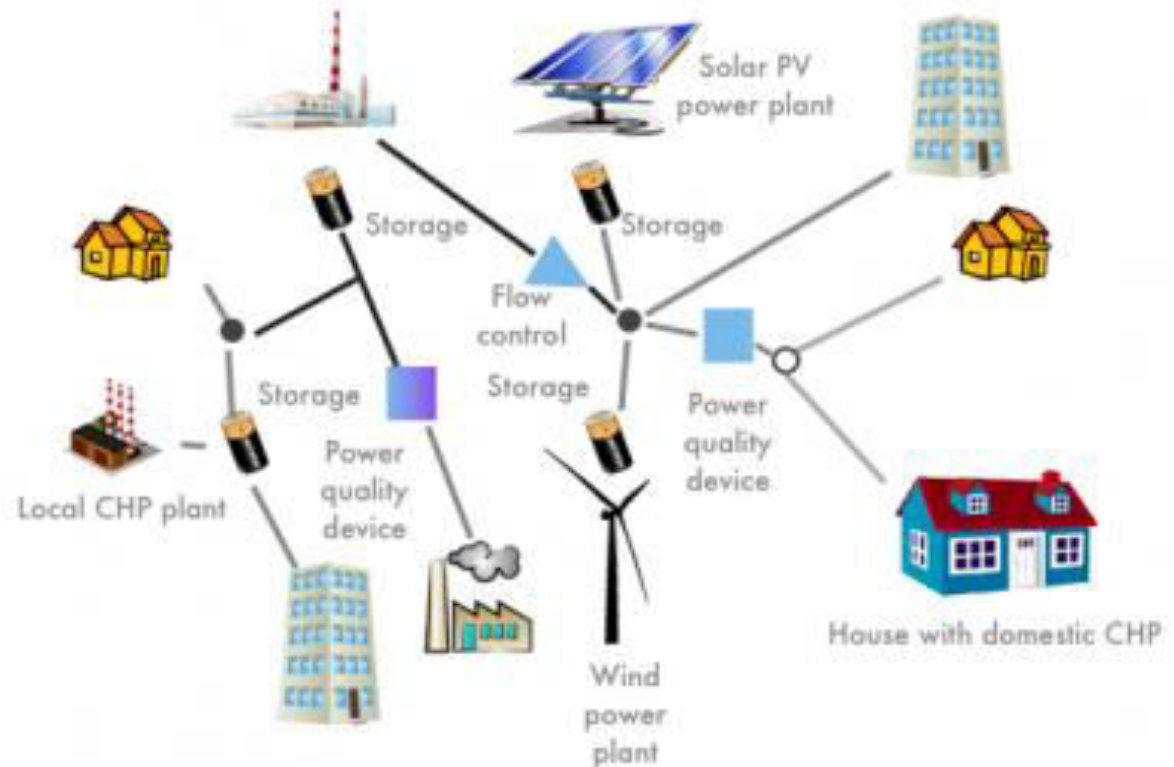
- Enables "plug-and-play" interconnection to multiple and Distributed Energy Resources (DER)
- Improved interconnection standards to enable a wide variety of generation and storage options
- Easier and more profitable for commercial users to install their own generation and storage facilities.
- Large environmentally-friendly central plants will be readily integrated into the transmission system and fossil fuel usage will be reduced
- Decentralized model that includes a balance of large, centralized generating plants as well as DER

# DECENTRALIZED POWER GRID

## Yesterday Centralized Power



## Tomorrow Clean, local power





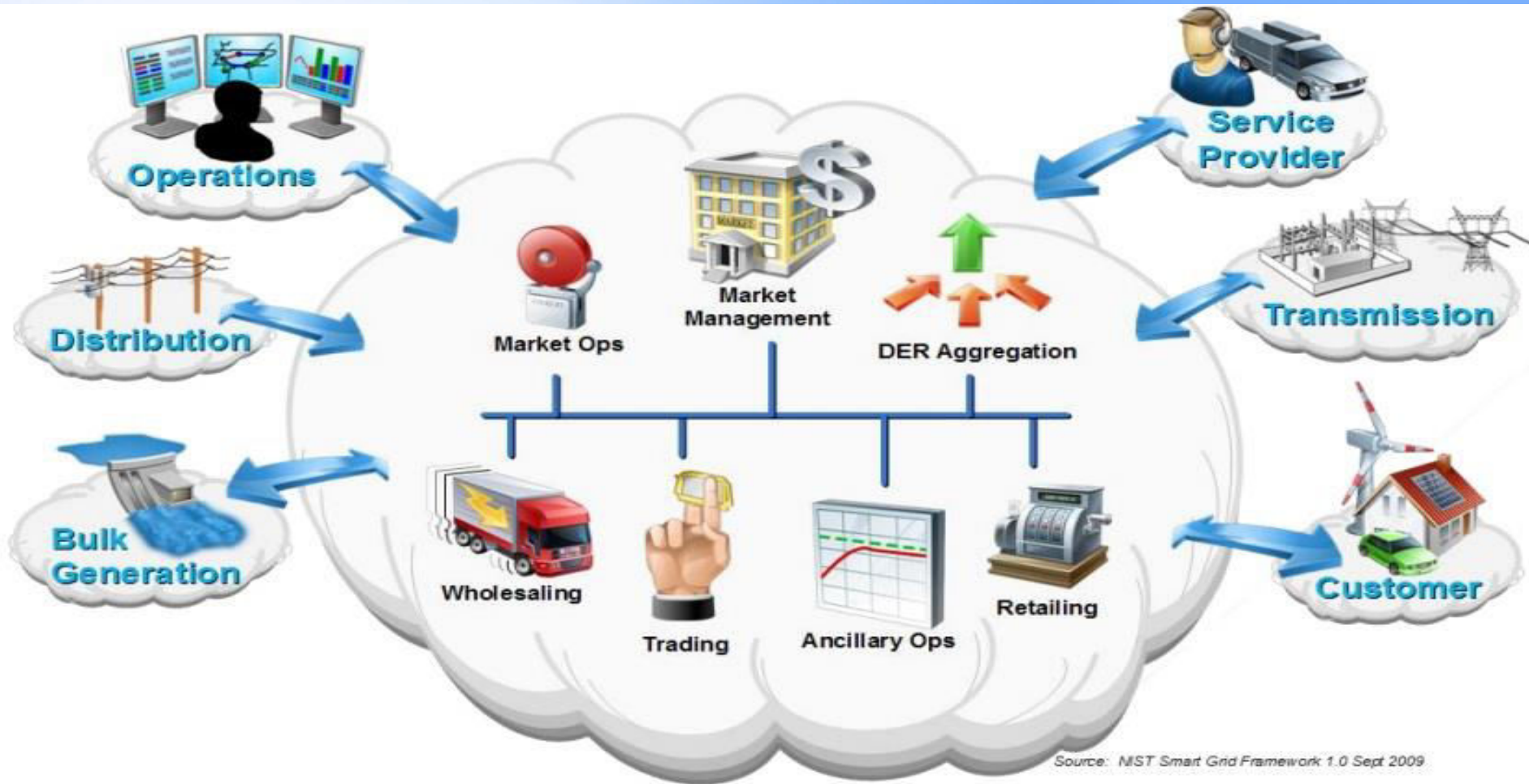
# ENABLES MARKETS

Modern grid will enable more market participation through:

- increased generation paths
- more efficient aggregated demand response initiatives
- placement of energy storage and resources within a more reliable distribution system

- Brokers, integrators, aggregators and enabled consumers will interact in real time with the electricity market
- By reducing congestion, the modern grid expands markets; it brings together more buyers and sellers
- New electricity markets will emerge by the introduction of new commercial goods and services (e.g. clean energy)

# OVERVIEW OF THE MARKETS DOMAIN





# OPTIMIZING ASSETS AND OPERATING EFFICIENTLY

- Assets will be managed to deliver only what is needed and only when it is needed
- Integration of near real-time data with advanced algorithms to improve decision-making and optimize both the capacity and the quality of electrical services
- With near real-time data, condition-based maintenance will dramatically improve equipment failure rates and reduce their maintenance costs
- Advanced Outages Management Systems (OMS) will significantly reduce the time to detect, locate, and diagnose outages

# SMART GRID BENEFITS

Defining trait	Benefit
Self-healing	Enhances cost savings, reliability and the profitable marketing of surplus power.
Active consumer participation	Consumers use more wisely, helping utilities produce more efficiently resulting in a wide range of environmental benefits
Resists attack	The grid deters or withstands physical or cyber attack
High quality power	Avoids productivity losses of downtime, especially in digital device environments
Multiple generation & storage options	Diverse resources with “plug-and-play” connections multiply the options for electrical generation and storage including new opportunities for more efficient, cleaner power production
Enables markets	The grid’s open-access market reveals waste and inefficiency and helps drive them out of the system while offering new consumer choices such as green power products.
Optimizes assets & operates efficiently	Desired functionality at minimum cost guides operations and the use of assets

# OUTLINE

TOPIC 1: Introduction to Intelligent Energy

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Technologies**

# SMART GRID COMPONENTS

- Intelligent appliances
- Smart power meters
- Smart substations
- Smart generation
- Smart distribution

# INTELLIGENT APPLIANCES

- Intelligent appliances are providing residential power consumers with insight into their energy consumption, facilitating energy-efficient and eco-friendly behavior
- Enable monitor of their usage and support remote management
- Capable of deciding when to consume power based on pre-set customer preferences
- Best candidates are the appliances consuming a lot of power and can be used with discretion, such as the HVAC (Heating Ventilation A/C) system, washers and dryers
- Consumers can save up to 25% on their energy usage

# INTELLIGENT APPLIANCES - EXAMPLES





# SMART POWER METERS

- Digital devices for measuring various features relative with electricity consumption
- Provide data on electricity price and consumption, CO2 emissions and show comparisons of energy usage on a given time frame basis
- Support two-way flow of information between them and electricity provider
- Enable demand response – that is actions taken to reduce the energy demand by end users





# SMART GENERATION

- Optimize the production of electricity utilizing different energy sources efficiently, flexible, fast and with cost-effectively
- Balance multiple energy sources to meet network requirements and consumption needs – balancing supply and demand
- Maintain voltage, frequency and power factor standards based on feedback from multiple points in the grid
- Each generator runs independently of the others (all run in parallel) and runs only when needed (based on load)

# SMART DISTRIBUTION

- Supports distributed energy resource deployment
- Enables self-healing, self-balancing and self-optimizing and autonomous restoration
- Utilizes the bi-directional flow of information to optimize distribution grid operations
- Enhances security of supply and power quality
- Automated monitoring and analysis tools capable of detecting or even predicting cable and failures based on real-time data about weather, outage history

# SMART SUBSTATIONS

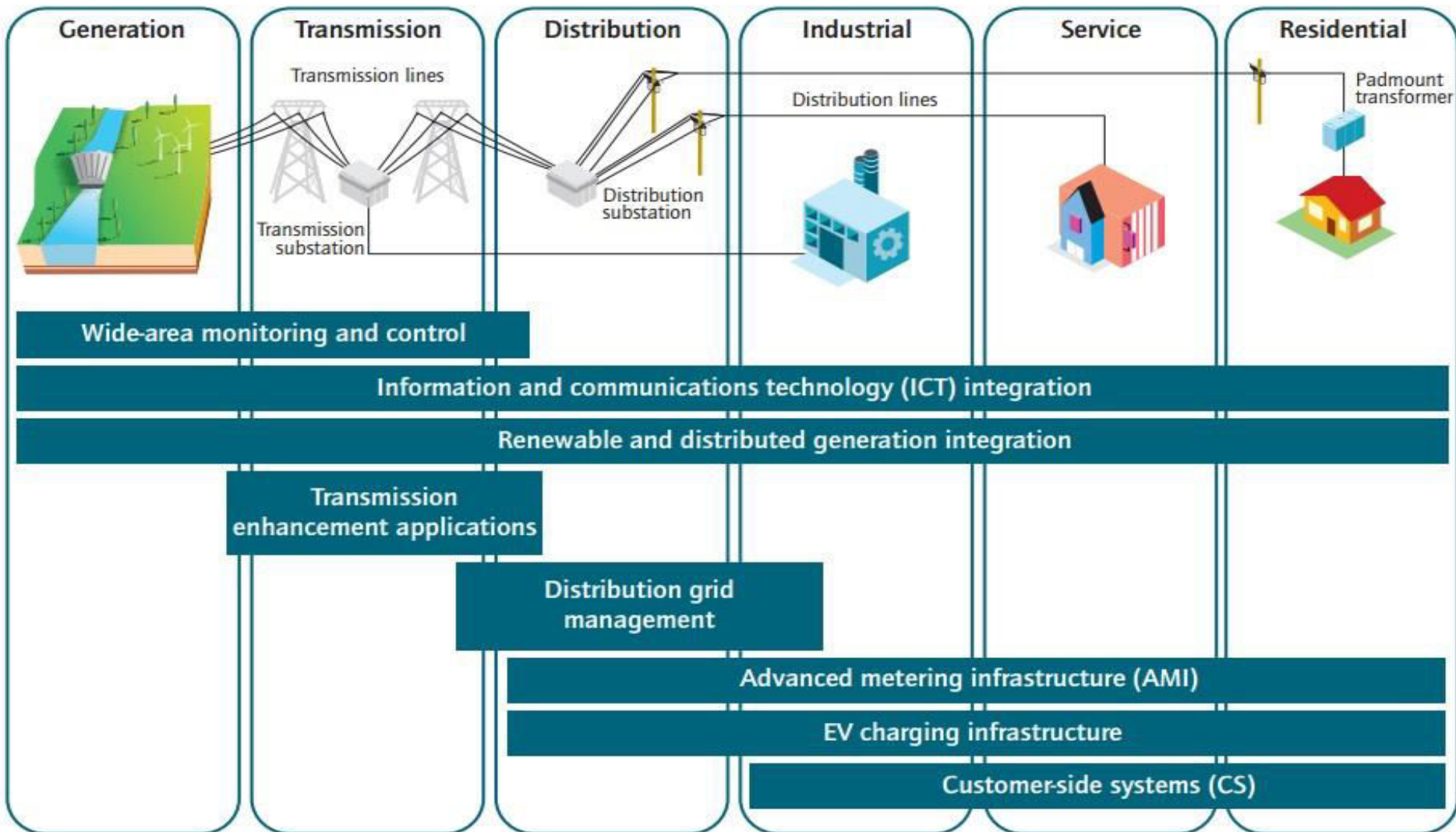
- Achieve the intelligent management of substation equipments by advanced data analysis processing methods based on advanced sensor technologies
- Support a series of sophisticated functions such as intelligent alarm and analysis, substation load transfer, device status visualization, battery monitoring, etc.



# SMART GRID TECHNOLOGICAL AREAS

- Wide area monitoring and control
- Renewable and distributed generation integration
- ICT integration
- Transmission enhancement applications
- Distribution grid management
- Advanced metering infrastructure (AMI)
- EV charging infrastructure
- Customer-side systems (CS)

# TECHNOLOGY SPAN IN THE SMART GRID





# WIDE AREA MONITORING AND CONTROL

- Real-time monitoring and display of power system components and performance
- Advanced system operation tools to avoid blackouts and facilitate the integration of renewable energy resources
- Monitoring and control technologies along with advanced system analytics:
  - Supervisory control and data acquisition (SCADA)
  - Wide-area situational awareness
  - Wide-area monitoring systems
  - Wide-area adaptive protection, control and automation

# MONITORING THE GRID





# RENEWABLE AND DISTRIBUTED GENERATION INTEGRATION

- Challenges for their dispatchability and controllability and for operation of the electricity system
- Energy storage systems can decouple the production and delivery of energy
- Automation of control of generation and demand to ensure balancing of supply and demand
- Power conditioning equipment for bulk power and grid support
- Communication and control hardware for generation and enabling storage technology

# ICT INTEGRATION

- Create a dynamic, high-speed interactive infrastructure for real-time information and power exchange
- System control software and enterprise resource planning (ERP) software to support the two-way exchange of information between stakeholders

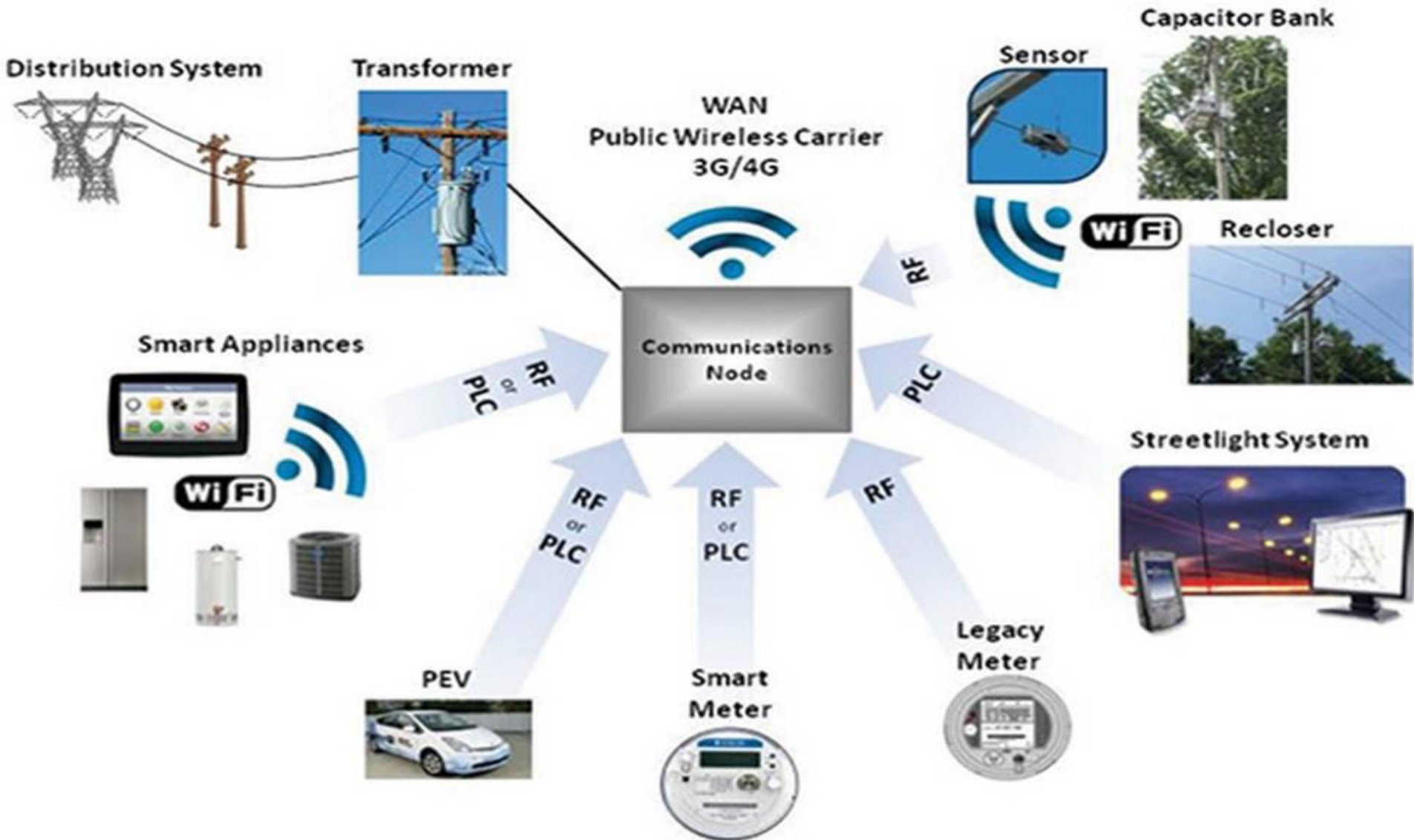
## *Wireless technologies :*

- *IEEE.802.11 (WiFi)*
- *IEEE.802.16 (WiMax)*
- *GSM/GPRS*

## *Wired technologies:*

- Fiber optics
- xDSL
- Power Line Communication

# COMMUNICATION TECHNOLOGIES



# TRANSMISSION ENHANCEMENT APPLICATIONS

- Flexible AC transmission systems (FACTS) are used to enhance the controllability of transmission networks and maximize power transfer capability
- High voltage DC (HVDC) technologies are used to connect offshore wind and solar farms to large power areas
- Dynamic line rating (DLR), can optimize utilization of existing transmission assets, without causing overloads
- High-temperature superconductors (HTS) can reduce transmission losses and enable economical fault-current limiting with higher performance

# DISTRIBUTION GRID MANAGEMENT

- Distribution and sub-station sensing and automation can:
  - reduce outage and repair time
  - maintain voltage level
  - improve asset management
- Sensor technologies enable condition- and performance-based maintenance of network components
- Geographic Information System (GIS), Distribution Management System (DMS), Outage Management System (OMS), Workforce Management System (WMS)



# DISTRIBUTION GRID MANAGEMENT SYSTEM



# ADVANCED METERING INFRASTRUCTURE

- Remote consumer price signals, which can provide time-of-use pricing information
- Collect, store and report customer energy consumption data for any required time intervals or near real time
- Improved energy diagnostics from more detailed load profiles
- Ability to identify location and extent of outages remotely via a metering function that sends a signal when the meter goes out and when power is restored
- Losses and theft detection



# EV CHARGING INFRASTRUCTURE

- Handles billing, scheduling and other intelligent features for smart charging (grid-to-vehicle)
- large charging installation will provide power system ancillary services, such as capacity reserve, peak load shaving and vehicle-to-grid regulation



# CUSTOMER-SIDE SYSTEMS

- Help manage electricity consumption at the industrial, service and residential levels
- Include energy management systems, energy storage devices, smart appliances and distributed generation
- Energy efficiency gains and peak demand reduction can be accelerated with in-home displays/energy dashboards, smart appliances and local storage
- Automated, price-responsive appliances and thermostats connected to an energy management system or controlled from the utility or system operator

# SMART GRID - SUMMARY

- Evolves traditional power system through monitoring and control, self-healing, automation, security etc.
- Provides consumers with information related to their energy usage (e.g. cost, alternative options etc.)
- Integrates renewable energy sources
- Adds energy storage abilities into the system

These lead to an energy system that is more **reliable**, **sustainable** and **resilient**.

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# IMAGE SOURCES

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<http://www.autoevolution.com/news/us-homebuilder-offers-ev-charging-infrastructure-preparation-17831.html>  
<http://www.smartmeters.com/sunpower-invests-tendrils-smart-energy-platform/>  
<http://ses.jrc.ec.europa.eu/smart-grid-cost-benefit-analysis>



***THANK YOU FOR YOUR ATTENTION!***





MODULE 2 – Introduction to Green Entrepreneurship

Title	Description
Level	tbd
Semester	N/A
ECTS	3 (90 hours)
Teaching language	tbd
Number of lectures	tbd
Number of labs	tbd
Homework	<p>Assignment 1: Identification of good practices in the field of Green Business and elaborate on the principles of environmental CSR that they address, as well as the principles of entrepreneurship</p> <p>Assignment 2: Develop a marketing plan, per good practice identified in Assignment 1</p>
Meetings/tutorial	tbd
Course objectives	<ul style="list-style-type: none"> <li>• To get introduced to the basic principles of environmental CSR;</li> <li>• To be able to develop an idea based on the principles of green entrepreneurship</li> <li>• To be able to draft a marketing plan for the Green Business Idea;</li> <li>• To understand the rules and regulation of Starting Your Green Business</li> <li>• To be able to draft a business plan for the Green Business Idea</li> </ul>
Course contents	<ul style="list-style-type: none"> <li>• What is entrepreneurship: an introduction</li> <li>• CSR principles, environmental pillar and what is a Green Business?</li> <li>• Are You Ready to Start Your Green Business?</li> <li>• Generate and Analyse Your Green Business Idea</li> <li>• Green Marketing Plan</li> <li>• Complying with the Rules and Regulations to Start Your Green Business</li> <li>• Starting the Green Business – Business Plan following PDCA</li> </ul>
Assessment	<p>Assignment 3: Elaboration of a business plan for a green business idea.</p>





**HANDOUT – MODULU 2 – Introduzzjoni għall Intraprenditorija Ħadra**

<b>Introduzzjoni</b>	<p>L-intraprenditorija hija l-kapaċità u r-rieda li tiżviluppa, torganizza u tmexxi negozju fid-dawl ta' xi wieħed mir-riskji tiegħu sabiex tagħmel profitt. L-iktar eżempju ovvjw tal-intraprenditorija huwa l-bidu ta' negozji ġodda. Fl-ekonomija, l-intraprenditorija flimkien mal-art, ix-xogħol, ir-rizorsi naturali u l-kapital jistgħu jipproduċu profitt. L-ispirtu intraprenditorjali huwa karatterizzat mill-innovazzjoni u t-tehid tar-riskji, u huwa parti essenzjali tal-kapaċità ta' nazzjon li jirnexxi fi suq globali dejjem jinbidel u dejjem aktar kompetittiv.</p> <p>Negozji ħodor huma negozji li huma impenjati li jnaqqsu l-impatt tagħhom fuq l-ambjent jew, li jiffokaw fuq skala akbar fuq is-sostenibbiltà.</p> <p>Is-sostenibbiltà tinkludi mhux biss il-konsiderazzjoni ta' kwistjonijiet ambjentali, iżda tinkludi elementi soċjali, ekonomiċi u ambjentali, magħrufa wkoll bħala t-tliet pilastri tas-sostenibbiltà.</p> <p>Strateġija għall-implimentazzjoni ta' valuri bħad-drittijiet tal-bniedem, l-ugwaljanza soċjali u naturalment ħarsien ambjentali, fin-negozju huwa l-kunċett tar-Responsabilità Soċjali Korporattiva (CSR).</p>
<b>Deskrizzjoni</b>	<p><b>sezzjonijiet e-learning fuq:</b></p> <ol style="list-style-type: none"> <li>1. X'inhi l-intraprenditorija: introduzzjoni</li> <li>2. Prinċipji tas-CSR, pilastri ambjentali u x'inhuma negozju ħodor?</li> <li>3. Il-ħolqien u analizi tal-idea tiegħek ta' negozju aħdar</li> <li>4. Inti lest biex tibda n-negozju aħdar tiegħek?</li> <li>5. Pjan ta' kummerċjalizzazzjoni</li> <li>6. Konformi mar-regoli u r-regolamenti li tibda negozju aħdar</li> <li>7. Bidu ta' negozju aħdar - pjan ta' negozju (PDCA)</li> </ol> <p><b>Assenjament 1:</b> Identifikazzjoni ta' prassi tajba fil-qasam ta' Green Business u elaborazzjoni fuq il-prinċipji tas-CSR ambjentali li huma jindirizzaw, kif ukoll il-prinċipji tal-intraprenditorija.</p> <p><b>Assenjament 2:</b> Żvilupp ta' pjan ta' marketing, skond il-prattika tajba identifikati f'Assenjament 1</p> <p><b>Assenjament 3:</b> Elaborazzjoni ta' pjan ta' negozju għal idea tan-negozju aħdar.</p>
<b>Referenzi</b>	<ul style="list-style-type: none"> <li>• Devine, Diane/Mizusawa, Lee/Gittell, Ross 2012: Sustainable business marketing.</li> <li>• Pascual, Oriol/van Klink, Arjen/ Rozo/Grisales, Julio Andrés: Create Impact! Handbook for Sustainable Entrepreneurship. Envia-innovators in sustainability 2011</li> <li>• Pott, Oliver/Pott, Andre (2012): Entrepreneurship: Unternehmensgründung, unternehmerisches Handeln und rechtliche Aspekte. Springer: Berlin, Heidelberg.</li> </ul> <p><b>Referenzi Online</b></p> <ul style="list-style-type: none"> <li>• <a href="http://2012books.lardbucket.org/books/sustainable-business-cases/s10-sustainable-business-marketing.html">http://2012books.lardbucket.org/books/sustainable-business-cases/s10-sustainable-business-marketing.html</a> [09.06.2015]</li> <li>• <a href="http://www.businessdictionary.com/definition/entrepreneurship.html">http://www.businessdictionary.com/definition/entrepreneurship.html</a> [08.06.2015]</li> </ul>



- <http://www.businessdictionary.com/definition/green-business.html> [08.06.2015]
- <https://www.changemakers.com/g20media/greenSMEs> [08.06.2015]
- [http://ec.europa.eu/enterprise/policies/sustainable-business/corporate-socialresponsibility/index\\_en.htm](http://ec.europa.eu/enterprise/policies/sustainable-business/corporate-socialresponsibility/index_en.htm) [09.06.2015]
- <http://www.greenonlinebusiness.net/starting-a-green-business/> [09.06.2015]
- Green paper - Promoting a European framework for corporate social responsibility. /\* COM/2001/0366 final \*/. In: <http://eur-lex.europa.eu/legalcontent/EN/TXT/?uri=CELEX:52001DC0366> [07.06.2015]
- [http://oin.at/\\_publikationen/PublikationenALT/Fachartikel/Strigl%202004%20cs%20in%20austria.pdf](http://oin.at/_publikationen/PublikationenALT/Fachartikel/Strigl%202004%20cs%20in%20austria.pdf) [07.06.2015]
- <http://www.sustainability4success.com/plan-do-check-act.html> [08.06.2015]
- [sustainabletx.org/.../116-green-business-plan-guide](http://sustainabletx.org/.../116-green-business-plan-guide) [07.06.2015]
- <http://www.wbcsd.ch/eurint/eeei.htm> [07.06.2015]

## REFERENCES ONLINE

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- <http://www.businessdictionary.com/definition/green-business.html> [08.06.2015]
- [http://courseblog-entrepreneurship.blogspot.co.at/2013/03/nature-and-development-of\\_8.html](http://courseblog-entrepreneurship.blogspot.co.at/2013/03/nature-and-development-of_8.html) [08.07.2015]
- <http://oin.at/publikationen/PublikationenALT/Fachartikel/Strigl%202004%20cs%20in%20austria.pdf> [07.06.2015]

### 2. CSR principles, environmental pillar and what is a green business?

- <http://www.wbcsd.ch/eurint/eeei.htm> [07.06.2015]
- <https://www.changemakers.com/g20media/greenSMEs> [08.06.2015]
- [http://ec.europa.eu/enterprise/policies/sustainable-business/corporate-socialresponsibility/index\\_en.htm](http://ec.europa.eu/enterprise/policies/sustainable-business/corporate-socialresponsibility/index_en.htm) [09.06.2015]
- Green paper - Promoting a European framework for corporate social responsibility. /\* COM/2001/0366 final \*/. In: <http://eur-lex.europa.eu/legalcontent/EN/TXT/?uri=CELEX:52001DC0366> [07.06.2015]

### 3. Generate and analyse your green business idea

*NB: No online references*

### 4. Are you ready to start your green business?

- <http://www.greenonlinebusiness.net/starting-a-green-business/> [09.06.2015]
- [sustainabletx.org/.../116-green-business-plan-guide](http://sustainabletx.org/.../116-green-business-plan-guide) [07.06.2015]

### 5. Green marketing plan

- <http://2012books.lardbucket.org/books/sustainable-business-cases/s10-sustainable-business-marketing.html> [09.06.2015]

### 6. Complying with the rules and regulations to start your green business

- <http://www.sustainability4success.com/plan-do-check-act.html> [08.06.2015]

### 7. Starting the green business – business plan following PDCA

- <http://www.sustainability4success.com/plan-do-check-act.html> [08.06.2015]



## O2 – Portafoll Ambjentali

### O2 - Environmental portfolio

Kors 3 – Intraprenditorija – Energija  
Intelligenti  
Course 3 - Entrepreneurship-Intelligent  
energy

Modulu 2 - Introduzzjoni għall  
Intraprenditorija Ħadra  
Module 2 – Introduction to Green  
Entrepreneurship  
Ġimgħa / Week 10

Żviluppatt minn: / Developed by:  
Best-Institut für berufsbezogene Weiterbildung  
und Personaltraining

# OBJECTIVES

- To get introduced to the history of entrepreneurship
- To define CSR
- To know the principles of green entrepreneurship

The teaching language at the University of Malta is English and therefore the course content is being presented in the English language to be used by any Maltese students/learners.

Il-lingwa tat-tagħlim fl-Università ta' Malta hija l-Ingliš u għalhekk il-kontenut tal-kors qed jiġi ppreżentat bil-lingwa Ingliża għal-użu tal-istudenti Maltin.

# TABLE OF CONTENTS

1. What is entrepreneurship: an introduction
2. CSR principles, environmental pillar and what is a green business? – part 1

References

# 1. WHAT IS ENTREPRENEURSHIP: AN INTRODUCTION

## General introduction to entrepreneurship

For a first introduction of what is “Entrepreneurship”, the definition of the online business dictionary covers many aspects and describes it as follows:

“Entrepreneurship is the capacity and willingness to develop, organise and manage a business venture along with any of its risks in order to make a profit. The most obvious example of entrepreneurship is the starting of new businesses. In economics, entrepreneurship combined with land, labour, natural resources and capital can produce profit. Entrepreneurial spirit is characterised by innovation and risk-taking, and is an essential part of a nation's ability to succeed in an ever changing and increasingly competitive global marketplace.”

<http://www.businessdictionary.com/definition/entrepreneurship.html>



# 1. WHAT IS ENTREPRENEURSHIP: AN INTRODUCTION

## Historical overview on entrepreneurship

Although the term “Entrepreneurship” is French, the origin, first developments can be located in the Anglo-American region. In fact, elementary structures of entrepreneurship existed since the middle age and developed through the centuries gaining complexity, in line with social and economic structures.

In the late 19th and early 20th centuries the focus of entrepreneurship lay on the economic perspective. E.g.: Andrew Carnegie, who built the American steel industry was characterised by his competitiveness rather than his creativity.

In the middle of the 20th century, the view changed and an entrepreneur was rather recognised as an innovator. E.g.: Edward Harriman, who reorganised the Ontario and southern railroad through the northern pacific trust.

# 1. WHAT IS ENTREPRENEURSHIP: AN INTRODUCTION

## Historical overview on entrepreneurship

The economist Joseph Schumpeter plays a key role in the entrepreneurship research. In the 30s of the 20th century he described the performance of an entrepreneur as not to invent something new but to explore it in a new way and successfully introduce it to the market. In this definition the focus shifts on the successful marketing of a, not necessarily new invented, product. However, the process of marketing itself requires creativity and inventive and entrepreneurial spirit.

This change of focus had a huge impact on the modern definition of entrepreneurship. In this sense companies such as Red Bull can be traced back to entrepreneurial ambition.

# 1. WHAT IS ENTREPRENEURSHIP: AN INTRODUCTION

## Entrepreneurship education

In 1947, the first entrepreneurship course was offered at Harvard University with the aim of supporting veterans in starting their own business. In the 1950s and 1960s, entrepreneurship education has been offered in many business schools, and the audience shifted to young people. In the 1970s, there has been a significant growth in this area due to the high demand for entrepreneurship courses.

In the 1980s the subject Entrepreneurship was connected with other areas. At this time also the first conferences and meetings were held.

In the 1990s veritable boom of entrepreneurship education can be registered.

In Europe, this development started later. In Germany, for example, the number of courses increased until the second half of the 1990s. A milestone in German history of entrepreneurship was the founding of EXISTProgramms in 1998. Through this funding start-up climate at universities should be improved.

# 1. WHAT IS ENTREPRENEURSHIP: AN INTRODUCTION

## Entrepreneurship education

In recent years, the importance of entrepreneurship and entrepreneurship education increased significantly. One reason was mainly the financial crisis of 2008. The crisis led to negative economic growth, high unemployment and poor career opportunities for young people. As a result, policy called to promote entrepreneurship, and students called for education in the field to compensate deficiencies in the area.

The European Commission responded to the economic crisis of 2008, e.g. with the action plan female entrepreneurship 2020. It intends to boost competitiveness and to achieve sustainable growth.

This action plan focuses on promotion of entrepreneurial education, improvement of the necessary business environment and to promote a generation of young entrepreneurs.

Another field of entrepreneurship is the so called “eco-preneurship” or “green entrepreneurship”, which will be described on the following slides.

# 1. WHAT IS ENTREPRENEURSHIP: AN INTRODUCTION

## Specific introduction to business and sustainability

Green businesses are businesses that are committed to reduce their impact on the environment or, on a larger scale focus on sustainability.

Sustainability includes not only the consideration of environmental issues, but comprises of the social, economic and environmental consideration, also known as the three pillars of sustainability.

A strategy to implement values such as human rights, social equality and, naturally, environmental protection, in business is the concept of Corporate Social Responsibility (CSR).

CSR is no uniform concept, but based on several principles and guidelines. The concept differs from country to country and even from company to company. For green businesses these principles can be a good foundation to ensure sustainability within the business.

# 1. WHAT IS ENTREPRENEURSHIP: AN INTRODUCTION

## Main obstacles in starting a green business

Starting a business in general, and a green business specifically, bears risks, but also opportunities. In the big picture, it is more difficult for SME start-ups, which build their business model on sustainable principles than for a large business that implements certain sustainable measures in their policies.

Lack of resources, insufficient management or economic depression are possible internal or external obstacles for new businesses.

On the other hand a quick reaction on market changes is possible due to the smaller size and therefore less complex structure of the business.



# 1. WHAT IS ENTREPRENEURSHIP: AN INTRODUCTION

## Potentials of starting a green business

There are many potential in green starter businesses. The focus on sustainability fits the entrepreneur as it can be seen in connection to individual worldviews, values and ideals. This view transports authenticity and intrinsic motivation of the product/service.

The afore mentioned obstacle, namely the risk, can be identified as potential of a new green business. As described before, taking risks is a key characteristic of any entrepreneur and associated with entrepreneurial spirit, as well as to show creativity and innovation.

Regarding to the business, green entrepreneurs prepare innovative solutions that fit the consumers needs and reflects the zeitgeist. This approach is typical for start-ups and can indeed be seen as a positive aspect compared to regular large business structures. Investing in sustainability covers some of these requirements and mark a change in doing business.



## 2. CSR PRINCIPLES, ENVIRONMENTAL PILLAR AND GREEN BUSINESS

### Definition of corporate social responsibility

First, it has to be noted that there is no common definition of corporate social responsibility (CSR). “Most definitions of corporate social responsibility describe it as a concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis.”

<http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52001DC0366>

The European Commission defines CSR as “the responsibility of enterprises for their impacts on society” (COM (2011) 681 ). The Commission encourages that enterprises “should have in place a process to integrate social, environmental, ethical human rights and consumer concerns into their business operations and core strategy in close collaboration with their stakeholders”.

[http://ec.europa.eu/enterprise/policies/sustainable-business/corporate-social-responsibility/index\\_en.htm](http://ec.europa.eu/enterprise/policies/sustainable-business/corporate-social-responsibility/index_en.htm)

## 2. CSR PRINCIPLES, ENVIRONMENTAL PILLAR AND GREEN BUSINESS

### CSR principles and guidelines

The commission promotes the implementation of CSR on national level and developed a strategy for advancing CSR in enterprises based on the listed guidelines and principles below. This list is based on internationally recognised CSR guidelines and principles, which have been identified and adopted by the European Commission in 2011:

- United Nations Global Compact (2000)
- United Nations Guiding Principles on Business and Human Rights (2011)
- ISO 26000 Guidance Standard on Social Responsibility (2010)
- International Labour Organization Tripartite Declaration of Principles concerning Multinational Enterprises on Social Policy (1977/1991/2001/2014)
- OECD Guidelines for Multinational Enterprises (2008/2011 Updated)

[http://ec.europa.eu/enterprise/policies/sustainable-business/corporate-social-responsibility/index\\_en.htm](http://ec.europa.eu/enterprise/policies/sustainable-business/corporate-social-responsibility/index_en.htm)

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- <http://courseblog-entrepreneurship.blogspot.co.at/2013/03/nature-and-development-of-8.html> [08.07.2015]
- <http://oin.at/publikationen/PublikationenALT/Fachartikel/Strigl%202004%20cs%20in%20austria.pdf> [07.06.2015]

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- <https://www.changemakers.com/g20media/greenSMEs> [08.06.2015]
- [http://ec.europa.eu/enterprise/policies/sustainable-business/corporate-socialresponsibility/index\\_en.htm](http://ec.europa.eu/enterprise/policies/sustainable-business/corporate-socialresponsibility/index_en.htm) [09.06.2015]
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Thank you!



## O2 – Portafoll Ambjentali

### O2 - Environmental portfolio

Kors 3 – Intraprenditorija – Energija  
Intelligenti  
Course 3 - Entrepreneurship-Intelligent  
energy

Modulu 2 - Introduzzjoni għall  
Intraprenditorija Hadra  
Module 2 – Introduction to Green  
Entrepreneurship  
Ġimgħa / Week 13

Żviluppatt minn: / Developed by:  
Best-Institut für berufsbezogene Weiterbildung  
und Personaltraining



# OBJECTIVES

- To get introduced to the basic principles of environmental CSR
- To be able to develop an idea based on the principles of green entrepreneurship
- To be able to draft a business plan for the Green Business Idea

The teaching language at the University of Malta is English and therefore the course content is being presented in the English language to be used by any Maltese students/learners.

Il-lingwa tat-tagħlim fl-Università ta' Malta hija l-Ingliż u għalhekk il-kontenut tal-kors qed jiġi pprezentat bil-lingwa Ingliża għal-użu tal-istudenti Maltin.

# TABLE OF CONTENTS

2. CSR principles, environmental pillar and what is a green business? – part 2
3. Generate and analyse your green business idea
4. Are you ready to start your green business?

References



## 2. CSR PRINCIPLES, ENVIRONMENTAL PILLAR AND GREEN BUSINESS

### The environmental pillar of CSR

The afore described principles and guidelines are fundamental aspects for integrating CSR strategies in business. With focus on the environmental pillar, the European Commission presented the GREEN PAPER in 2001 promoting a European framework for corporate social responsibility, which suggests following procedures:

- Management of environmental impacts and natural resources on the internal dimension
- Global Environmental concerns on the external dimension

Green paper - Promoting a European framework for corporate social responsibility. /\* COM/2001/0366 final

These procedures regarding to the environmental CSR are described below as part of green business, as they can be seen in connection to economic issues.

## 2. CSR PRINCIPLES, ENVIRONMENTAL PILLAR AND GREEN BUSINESS

- Management of environmental impacts and natural resources on the internal dimension

To manage environmental impact of businesses there are measures that can be easily carried out, such as waste management. In general, reducing the consumption of resources and polluting emissions can lead to a lower environmental impact. Reducing energy and waste disposal bills businesses can decrease their input and de-pollution costs.

see Green paper - Promoting a European framework for corporate social responsibility. /\* COM/2001/0366 final

The reduction of usage can increase a businesses` profitability and competitiveness. Profitable investments in sustainability are known as “win-win” situations - good for business and good for the environment.

see <http://www.wbcsd.ch/eurint/eeeei.htm>

## 2. CSR PRINCIPLES, ENVIRONMENTAL PILLAR AND GREEN BUSINESS

- Global Environmental concerns on the external dimension

Through the trans boundary effect of many business-related environmental problems, and their consumption of resources from across the world, companies are also actors in the global environment. They can therefore pursue social responsibility internationally as well as in Europe. For example, they can encourage better environmental performance throughout their supply chain within the IPP approach and make larger use of European and international management and product-related tools. Investment and activities of the companies on the ground in third countries can have a direct impact on social and economic development in these countries.

see Green paper - Promoting a European framework for corporate social responsibility. /\* COM/2001/0366 final

## 2. CSR PRINCIPLES, ENVIRONMENTAL PILLAR AND GREEN BUSINESS

### Definition of green business

“Green business is a business functioning in a capacity where no negative impact is made on the local or global environment, the community, or the economy. A green business will also engage in forward-thinking policies for environmental concerns and policies affecting human rights.”

<http://www.businessdictionary.com/definition/green-business.html>

Green business strategies are often associated with large business due to their resources and name recognition. Therefore it is understandable that ratings of top green businesses include brands like Deloitte, IKEA or Apple. But also SMEs are promoted to implement sustainable measures in their business strategies or even are build up on such ones. E.g. (from [www.changemakers.com](http://www.changemakers.com)): the Ugandan SME “the Solar Sisters” employs women to sell solar-powered LED lamps for residential use, which increased women’s employment on the one hand and reduced dependence on polluting and inefficient forms of lighting on the other hand.

<https://www.changemakers.com/g20media/greenSMEs>

# 3. GENERATE AND ANALYSE YOUR GREEN BUSINESS IDEA

## Process of idea generating

The “Create Impact! Handbook for Sustainable Entrepreneurship” defines the following five steps for generating and analysis a business idea:

### 1. Getting to know the user

To understand the users` needs and in order to develop solutions that fit those needs, it is important to identify characteristics and elements that others may overlook. Observation skills can be practiced in every day activities; for instance, by identifying situations which evoke certain feelings, such as frustration.

Identifying products, activities and situations that could be made in a simpler, friendlier, or more efficient way and recording these observations is a useful practice for idea finding, when trying to solve a specific problem.

see Pascual et al. 2011, p.31

# 3. GENERATE AND ANALYSE YOUR GREEN BUSINESS IDEA

## 2. Idea generation

As described before, to have and generate an idea is a good foundation of starting a green business. New ideas often arise from simple questions like 'What is this?', 'What is it for?' or 'What could it be for?' Questioning the basic uses of utensils in everyday life give space to new opportunities. Therefore, looking at things from another point of view is the first step to solutions and innovations. This activity empowers creativity and supports the creation of ideas.

see Pascual et al. 2011, p.31

## 3. Development of ideas

The activities of the steps of getting to know the user and idea generation support the development of ideas. The goal is to develop as many ideas as possible. This work is more productive in a group with a variety of personalities and different fields of expertise. Therefore brainstorming session where participants actively contribute with ideas can be promoted and the following aspects should be considered: the goal is to collect as many ideas as possible and to write them down; every idea is welcome; they can be clustered and further developed.

see Pascual et al. 2011, p.31



# 3. GENERATE AND ANALYSE YOUR GREEN BUSINESS IDEA

## 4. Prototyping solutions

As soon as solutions are shared with others, better. The goal is to detect failures and possibilities for improvement in a early stage. It is very expensive and complicated to make changes once a design is taken for a finished product/service that has been placed into the market. The task for this phase is to visualise the idea as soon as possible using available materials. The goal is to get along without complex and costly resources, but instead use creative thoughts. Prototyping can be seen as a good practice for developing new ideas, and for exploring different directions.

see Pascual et al. 2011, p.32

## 5. Iterations

After validation of prototypes by the target group. With the creation of a tool, such as an object or a video that can be iterate at low costs, the iterative process begins. It includes several passes of testing, modifying and repeating phases until the solution is completely validated by the member of the target group. Therefore it is also important to develop prototypes fast.

see Pascual et al. 2011, p.32



# 4. ARE YOU READY TO START YOUR GREEN BUSINESS?

## Business model

To start a green business there are several issues that have to be considered. First, a business idea is to develop and to draft as business model. If the same or a similar idea or model already exists, the barriers to entry and competition are high as well as the financial expenses.

Ideally, the business model fulfils 3 criteria:

- Innovative nature
- Creation of a specific customer benefit
- High earning potential

see Pott&Pott, 2012, p.63



Fig.1: Are you ready to grow.  
(marketingwithheart.co)

# 4. ARE YOU READY TO START YOUR GREEN BUSINESS?

## Benefits of new ideas

The main benefit of starting a business based on a new idea is the (current) monopoly. Due to this monopoly prices can be set on a high level and demand and potential can be exploited, thereby growth is accelerated. This results in cost advantages. Also valuable market experience can be collected in this process. Good relationships with suppliers and customers are necessary to benefit against competitors.

see Pott&Pott, 2012, p.63

## Disadvantages of new ideas

Initial investments have to be taken in order to increase the level of awareness and to overcome scepticism among customers. Additional costs for lack of infrastructure and to develop a product can occur. Therefore a financial calculation and planning for avoiding mistakes is recommended.

see ibid.

# 7. STARTING THE GREEN BUSINESS – BUSINESS PLAN FOLLOWING PDCA

## What is a business plan?

A business plan is the basis of business creation and contains at least the following information:

- A description of the product/service, considering the market and competition
- Marketing and sales strategy
- Description of the business model and organisation, its distribution and strategies
- Introduces the entrepreneur and the key staff
- Presents a structured implementation schedule of the main activities and budget
- It is recommended to list opportunities and risks as conclusion

see Pott&Pott 2012, p.192

# REFERENCES ONLINE

## 2. CSR principles, environmental pillar and what is a green business?

- <http://www.wbcsd.ch/eurint/eeeei.htm> [07.06.2015]
- <https://www.changemakers.com/g20media/greenSMEs> [08.06.2015]
- [http://ec.europa.eu/enterprise/policies/sustainable-business/corporate-socialresponsibility/index\\_en.htm](http://ec.europa.eu/enterprise/policies/sustainable-business/corporate-socialresponsibility/index_en.htm) [09.06.2015]
- Green paper - Promoting a European framework for corporate social responsibility. /\* COM/2001/0366 final \*/. In: <http://eur-lex.europa.eu/legalcontent/EN/TXT/?uri=CELEX:52001DC0366> [07.06.2015]

## 3. Generate and analyse your green business idea

*NB: No online references*

## 4. Are you ready to start your green business?

- <http://www.greenonlinebusiness.net/starting-a-green-business/> [09.06.2015]
- [sustainabletx.org/.../116-green-business-plan-guide](http://sustainabletx.org/.../116-green-business-plan-guide) [07.06.2015]



Thank you!





## O2 – Portafoll Ambjentali

### O2 - Environmental portfolio

Kors 3 – Intraprenditorija – Energija  
Intelligenti  
Course 3 - Entrepreneurship-Intelligent  
energy

Modulu 2 - Introduzzjoni għall  
Intraprenditorija Ħadra  
Module 2 – Introduction to Green  
Entrepreneurship  
Ġimgħa / Week 16

Żviluppatt minn: / Developed by:  
Best-Institut für berufsbezogene Weiterbildung  
und Personaltraining

# OBJECTIVES

- To get introduced to the basics of green marketing
- To be able to draft a marketing plan for the Green Business Idea
- To know the rules and regulation of Starting Your Green Business
- To be able quality management tools for the Green Business

The teaching language at the University of Malta is English and therefore the course content is being presented in the English language to be used by any Maltese students/learners.

Il-lingwa tat-tagħlim fl-Università ta' Malta hija l-Ingliż u għalhekk il-kontenut tal-kors qed jiġi pprezentat bil-lingwa Ingliża għal-użu tal-istudenti Maltin.



# TABLE OF CONTENTS

- 5. Green marketing plan
- 6. Complying with the rules and regulations to start your green business
- 7. Starting the green business – business plan following PDCA

## References

# 5. GREEN MARKETING PLAN

## Marketing plan

According to the publication “sustainable business cases” (2012) “a marketing plan is derived from the company’s vision and integrates an organisation’s overall goals and marketing objectives (what goals they want to achieve) and strategies (how they are going to achieve them) into a cohesive plan, typically on an annual basis. The green marketing plan focuses on the ideal marketing mix to achieve maximum profit potential while adhering to sustainability principles.”

Devine et al. 2012, <http://2012books.lardbucket.org/books/sustainable-business-cases/s10-sustainable-business-marketing.html>

For a successful use of marketing strategies the 4 Ps of conventional marketing can be followed and easily implemented into the different areas of a company, aiming to show it commitment and sustainability.

see ibid.

# 5. GREEN MARKETING PLAN

## The 4 Ps of marketing

The four Ps of marketing (Product, Price, Place and Promotion) are also known as the 'Marketing Mix'. The Marketing Mix is a crucial tool in determining a product's offering to the customer.:

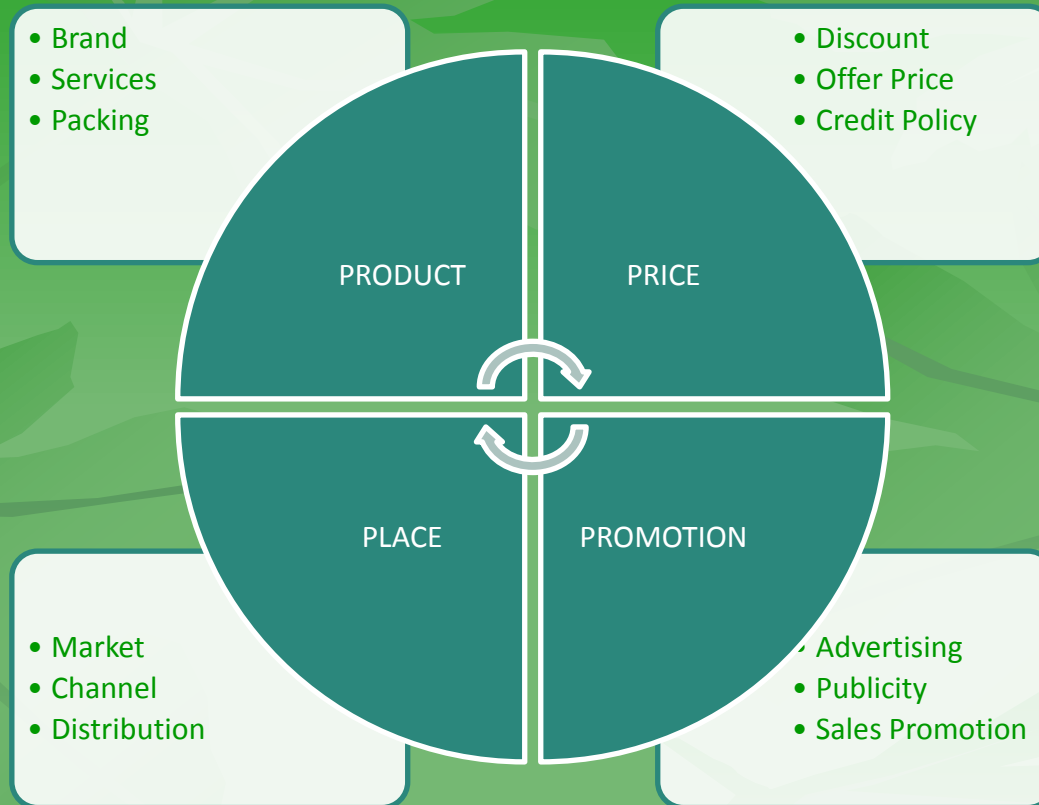


Fig.2: The 4 Ps of Marketing  
<http://www.mbaskool.com/business-concepts/marketing-and-strategy-terms/6778-4-ps-of-marketing.html>

# 5. GREEN MARKETING PLAN

## Product

The product can either be tangible, which have independent physical existence (from needle to motor parts) or intangible service (like in IT and tourism industry). Launching the right kind of product with appropriate number of variants is one of the critical decisions for marketing managers.

## Price

The price of a product determines the offering which the customers are willing to give to buy that product. The price can neither be too low that the seller incurs losses, nor be too high that the consumers cannot afford the product.

The price of a product or a service depends on its demand, which is determined by demand elasticity. A product is said to be elastic if raising its price reduces the demand considerably (e.g. coffee, people will switch to tea) and the product/service is inelastic if its demand is not affected even after raising the price (e.g. petrol).

<http://www.mbaskool.com/business-concepts/marketing-and-strategy-terms/6778-4-ps-of-marketing.html>

# 5. GREEN MARKETING PLAN

## Place

The market where the product is sold is known as the place. The markets should be convenient for the consumers to access. Distribution network for a product determines its availability in shops/outlets.

## Promotion

The method of communication by which the marketer provides information about the product is known as promotion. It included advertisements, personal selling, word of mouth publicity etc.

<http://www.mbaskool.com/business-concepts/marketing-and-strategy-terms/6778-4-ps-of-marketing.html>

# 5. GREEN MARKETING PLAN

To achieve these goals, the following aspects that any good marketing plan should includes are:

- **Corporate goals**

They represent the companies general goals and harmonise with its strategic plan and vision on a long range.

- **Objectives**

From the corporate goals, marketing objectives can be settled and have to be specified, such as to grow to 5% market share.

- **Strategies**

After the objectives are determined, the strategies for achieving these need to be developed (e.g. conversion of all product ingredients to those that are locally sourced to help meet the objective of minimising the company's carbon footprint).

Devine et al. 2012, [http://2012books.lardbucket.org/books/sustainable-business-cases/s10\\_sustainable-business\\_marketing.html](http://2012books.lardbucket.org/books/sustainable-business-cases/s10_sustainable-business_marketing.html)

# 5. GREEN MARKETING PLAN

- Tactics

Tactics are the ways established to achieve the strategies , including the four Ps (e.g. identification of the local suppliers and costs to achieve a buy local strategy).

- Market

Implies the determination of the targeted market and analysis of the current stage of the products life cycle: development, introduction, growth, maturity, etc. For green products especially, there may be opportunity to add a new dimension to a mature category with a new product benefit.

- Consumer target audience

Identification of the target group and definition of segments. The aim is to identify the optimal target to achieve marketing objectives.

Devine et al. 2012, <http://2012books.lardbucket.org/books/sustainable-business-cases/s10-sustainable-business-marketing.html>



# 6. COMPLYING WITH THE RULES AND REGULATIONS TO START YOUR GREEN BUSINESS

## Starting a green business

The precondition to start a green business vary from country to country and depends on the legal situation regarding to the business foundation and environmental framework. Besides these factors, the nature of the business needs certain consideration of laws. Depending on these factors, legal requirements need to be discovered towards:

- Legal form of business
- Commercial law
- Plant permit law
- Social security act
- Environmental laws and regulations
- Etc.

# 7. STARTING THE GREEN BUSINESS – QUALITY MANAGEMENT FOLLOWING PDCA

The deming/PDCA cycle

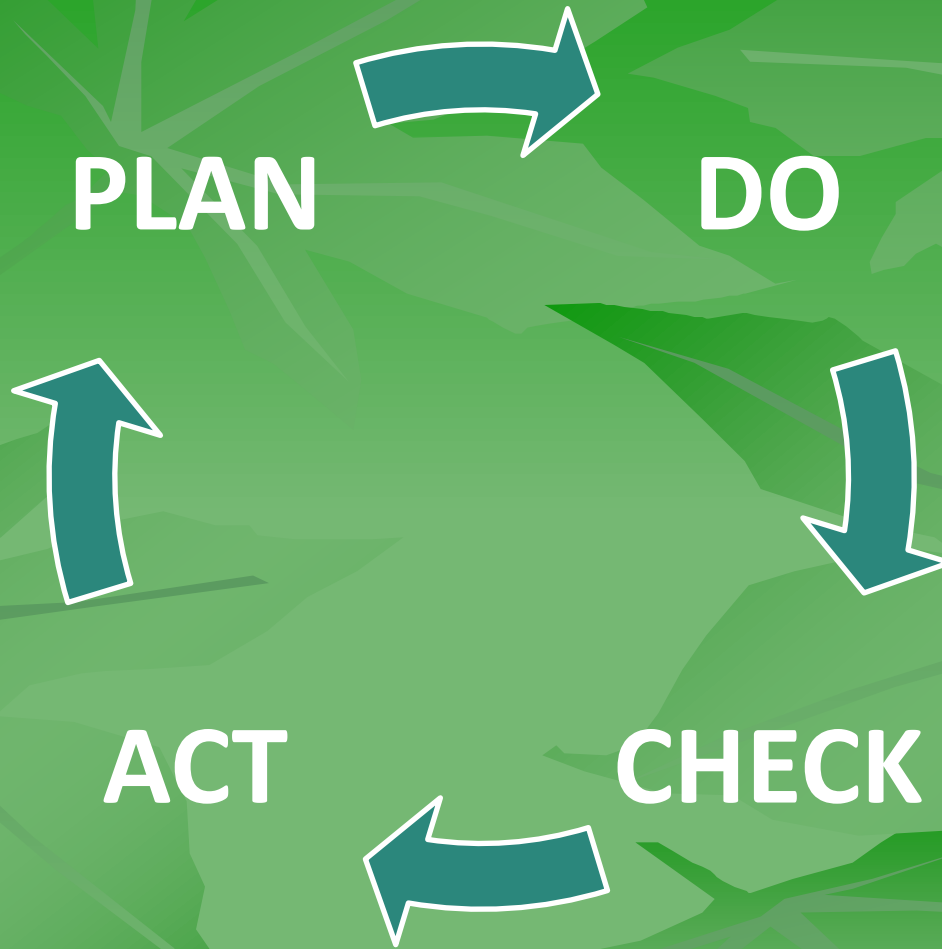


Fig.3: The deming/PDCA cycle

# 7. STARTING THE GREEN BUSINESS – QUALITY MANAGEMENT FOLLOWING PDCA

## Plan

The planning starts with the definition of measureable and written goals, which can be applied to relevant policies (e.g. for receiving environmental certification, specific requirements have to be considered). For each step, the responsibilities needed to achieve those goals are defined (e.g. the overarching goal is to reduce energy use in the office by 5% in the next two years; a timeline including deadlines for tasks and responsibilities is set up).

## Do

This phase includes the implementation of the plan. A selected person selected for the purpose will be responsible for the status of the individual tasks and collecting data. Once again, the timeline is to be considered.

<http://www.sustainability4success.com/plan-do-check-act.html>

# 7. STARTING THE GREEN BUSINESS – QUALITY MANAGEMENT FOLLOWING PDCA

## Check

At this point, the achievement of the goals within the set timeline is evaluated. If the evaluation shows that the goals are achieved, further goals are set and standards become higher. If not, it will be needed to analyse the failure(s) and modify the goals, taking into consideration question as: Why were not all results from energy audit put into practice? What needs to be put in place to save those 5% of energy?

## Act

Aims to work and improve insufficient results due to their weak evaluation. The change of strategies to improve the performance of the company must be considered (e.g. set an application for a governmental grant for the implementation of low-energy light bulbs, due to the energy auditor advise).

<http://www.sustainability4success.com/plan-do-check-act.html>

# REFERENCES ONLINE

## 5. Green marketing plan

- <http://2012books.lardbucket.org/books/sustainable-business-cases/s10-sustainable-business-marketing.html> [09.06.2015]

## 6. Complying with the rules and regulations to start your green business

- <http://www.sustainability4success.com/plan-do-check-act.html> [08.06.2015]

## 7. Starting the green business – business plan following PDCA

- <http://www.sustainability4success.com/plan-do-check-act.html> [08.06.2015]



Thank you!

### KORS III. INTRAPRENDITORIJA - ENERĠIJA INTELLIĠENTI

#### MODULU 3 (SETTURI TA' APPLIKAZZJONI TA' INTRAPRENDITORIJA ĦADRA) – HANDOUT

<b>Introduzzjoni</b>	<p>L-intraprenditorija ħadra tirreferi għan-negozji li għandhom fil-mira tagħhom prodotti, servizzi jew proċessi fejn l-għan aħħari jkun li jibbenefika l-ambjent. It-terminu "aħdar" tiffoka fuq aspetti varji, bħall-ħolqien u l-konsum tal-enerġija mingħajr ma jniġġes l-ambjent, l-integrazzjoni ta' sorsi ta' enerġija rinnovabbli u tnaqqis tal-użu tal-fjuwils fossili u l-ġestjoni tal-enerġija b'mod effiċjenti kemm jista' jkun lejn konsum sostenibbli u l-isfruttament ta' enerġija prodotta fil-livell massimu filwaqt li jimplementa proċessi ta' skart minimu.</p> <p>L-intraprenditorija ħadra diġà sabet il-post tagħha u bħalissa qegħda tespandi fis-setturi differenti, bħal bliet u t-trasport intelligenti. Il-motivazzjoni, l-ambitu u l-impatt ta' dan l-approċċ aħdar ivarja matul dawn l-oqsma, fejn bosta ICTs qed jaħdmu sabiex jinkiseb użu effiċjenti u sostenibbli tal-enerġija.</p> <p>Fid-dawl ta' dan kollu, dan il-modulu għandu l-għan li jipprovdi ħarsa ġenerali ta' xi setturi ewlenin ta' applikazzjoni ta' intraprenditorija ħadra flimkien mal-karatteristiċi bażiċi tal-implimentazzjoni ta' enerġija intelligenti.</p>
<b>Deskrizzjoni</b>	<p><b>E-Learning:</b> Preżentazzjoni tat-tliet setturi ta' applikazzjoni ta' intraprenditorija ħadra ewlenin, jiġifieri enerġija intelligenti tal-bliet, bini u t-trasport. Deskrizzjoni tal-karatteristiċi ewlenin, l-isfidi u l-opportunitajiet ta' kull settur u għarfien fil-mod kif l-enerġija intelligenti tiġi implimentata sabiex jinkisbu soluzzjonijiet ekoloġiċi.</p> <p><b>Assenjament 1:</b> L-istudent mitlub jellabora fuq soluzzjoni ħadra għall-lokal li jgħix fih, jiddeskrivi l-motivazzjoni, l-oġettivi, l-impatt mistenni u applikazzjonijiet ICT tal-proposta tagħhom.</p> <p><b>Assenjament 2:</b> L-istudent mitlub jiddeskrivi l-kunċett ta' sistemi HVAC, il-komponenti bażiċi tagħhom u t-teknoloġiji ewlenin użati fit-tweqqif tagħhom.</p> <p><b>Assenjament 3:</b> L-istudent mitlub jipprovdi ħarsa ġenerali tal-infrastruttura eżistenti għall-iċċarġjar ta' vetturi elettriċi u jiddeskrivi l-perspettivi tal-evoluzzjoni tagħhom.</p>
<b>Referenzi</b>	<p>Dincer, I. and Rosen, M. A. (2007). Exergy: energy, environment and sustainable development, Elsevier, Oxford, UK</p> <p>Rosen, M.A., Le, M.N., and Dincer, I. (2005). Efficiency analysis of a cogeneration and district energy system. Appl Thermal Eng, 25, 147–159</p> <p>Gustafsson, J., Delsing, J. , and Deventer, J. (2010). Improved district heating substation efficiency with a new control strategy Appl Energy, 87, 1996–2004</p> <p>Frost and Sullivan (2011). The Key to Cost-Effective and Sustainable Buildings: Intelligent Energy.</p> <p>European Commission (2010). 'EU energy and Transport in Figures - Statistical Pocket Book 2010'.</p> <p>Institute for building efficiency (<a href="http://www.institutebe.com/">http://www.institutebe.com/</a>)</p>



	<p><a href="http://www.accenture.com/SiteCollectionDocuments/PDF/Accenture-Energy-Smart-Buildings.pdf">http://www.accenture.com/SiteCollectionDocuments/PDF/Accenture-Energy-Smart-Buildings.pdf</a></p> <p>Grob, G.R. (2009). Future Transportation with Smart Grids &amp; Sustainable Energy SYSTEMICS, CYBERNETICS AND INFORMATICS, 7(5), 50-54</p>
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***EPOQUE: PORTAFOLL AMBJENTALI GHALL-KWALITÀ FL-  
EDUKAZZJONI UNIVERSITARJA***  
***ÉPOQUE: ENVIRONMENTAL PORTFOLIO FOR QUALITY IN  
UNIVERSITY EDUCATION***  
**KORS III / COURSE III**

**INTRAPRENDITORIJA - ENERĠJA INTELLIGENTI**  
**ENTREPRENEURSHIP – INTELLIGENT ENERGY**

**MODULU / MODULE 3**  
**INTRAPRENDITORIJA ĦADRA / GREEN ENTREPRENEURSHIP**

# OUTLINE

## TOPIC 1: Smart Energy Cities

## TOPIC 2: Smart Energy in Buildings

## TOPIC 3: Smart Energy in Transport

*The teaching language at the University of Malta is English and therefore the course content is being presented in the English language to be used by any Maltese students/learners.*

*Il-lingwa tat-tagħlim fl-Università ta' Malta hija l-Ingliż u għalhekk il-kontenut tal-kors qed jiġi ppreżentat bil-lingwa Ingliża għal-użu tal-istudenti Maltin.*

# GREEN ENTREPRENEURSHIP APPLICATION SECTORS

## Smart cities



## Transport



## Smart buildings



# OUTLINE

**TOPIC 1: Smart Energy Cities**

**TOPIC 2: Smart Energy in Buildings**

**TOPIC 3: Smart Energy in Transport**

# ENERGY IN CITIES

- Today, more than half of the population is living in urban environments
- By 2030, 60% of the population worldwide will live in a city, and by 2050, this proportion will reach 70%
- Within the EU, cities are responsible for about 70% of the overall primary energy consumption, which will rise to 75% by 2030
- Consequently, cities are responsible for a significant share of the world's greenhouse gas emissions
- Cities are complex and dynamic ecosystems where the majority of the energy services are provided



# CHALLENGES AND OPPORTUNITIES

- Address the growing energy needs of rising population in urban environments
- Reduce greenhouse gas emissions and become more environment-friendly
- Reduce fossil fuel usage for security and climate
- Implement cost-effective solutions for sustainability
- Efficient balancing of energy supply and demand
- Promote the use of locally available renewable energy resources

**The smart city concept has emerged**



# SMART CITY



# SMART ENERGY CITY CONCEPT

According to relative research in the context of the EU-FP7 TRANSFORM project ([www.transformproject.eu](http://www.transformproject.eu)), the smart energy city is defined as:

“highly energy and resource efficient; increasingly powered by renewable energy sources; relies on integrated and resilient resource systems, as well as insight-driven and innovative approaches to strategic planning. The application of information, communication and technology are commonly a means to meet these objectives.

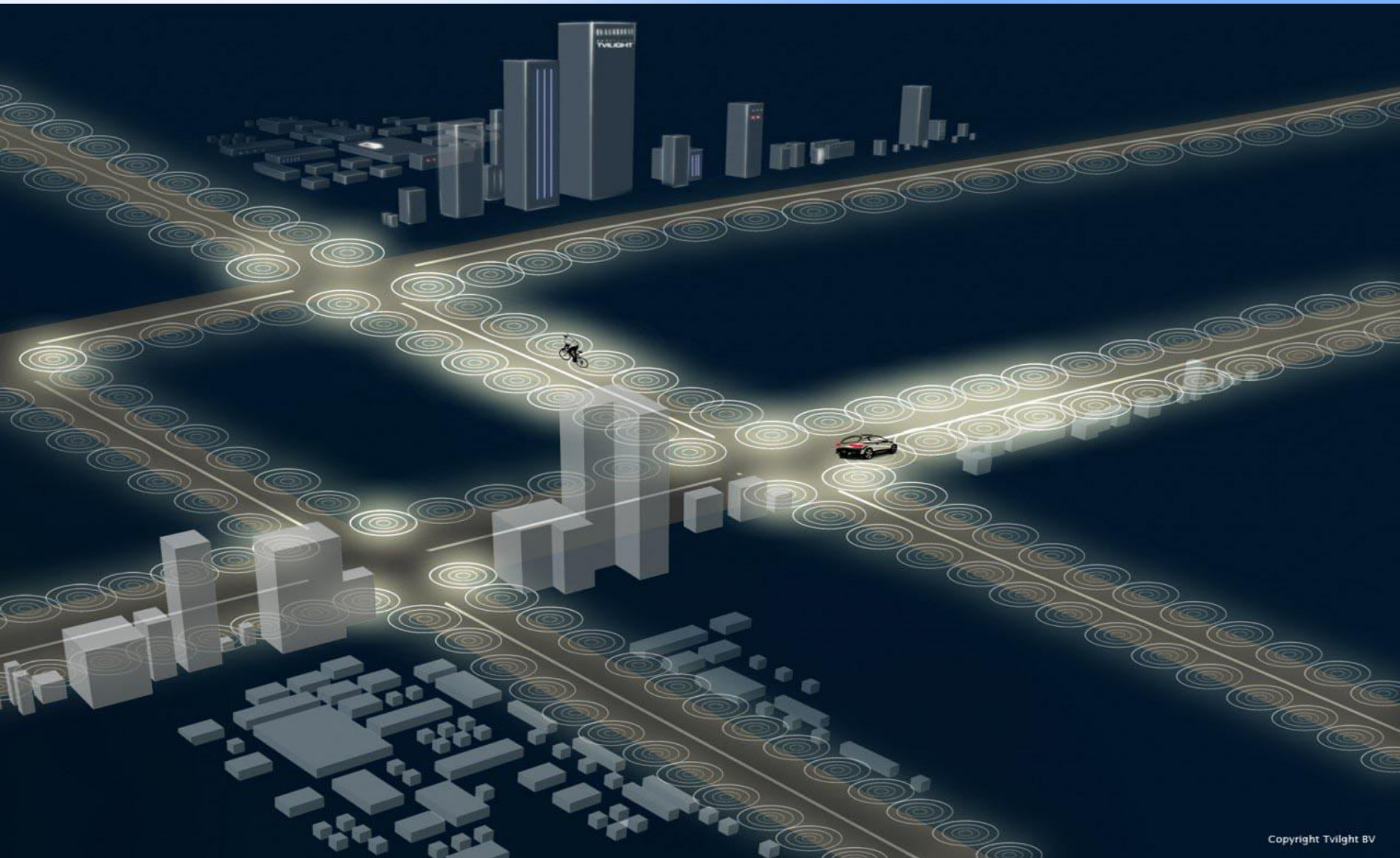
It provides its users with a liveable, affordable, climate-friendly and engaging environment that supports the needs and interests of its users and is based on a sustainable economy”

# INTELLIGENT STREET LIGHTING

- Cameras and/or sensors enable lights to detect movement and activate
- Lights are interconnected and communicate
- Remote monitoring enables efficient control – defection warnings, dimming times, brightness, etc.
- Decreased energy usage and CO<sub>2</sub> emissions
- Reduction of light pollution
- Maintenance cost reduction – lights operational duration is increased



# INTELLIGENT STREET LIGHTING – HOW IT WORKS



# DISTRICT HEATING AND COOLING (DHC)

- Heating represents the largest energy end-use in Europe
  - about 50% of total final energy consumption

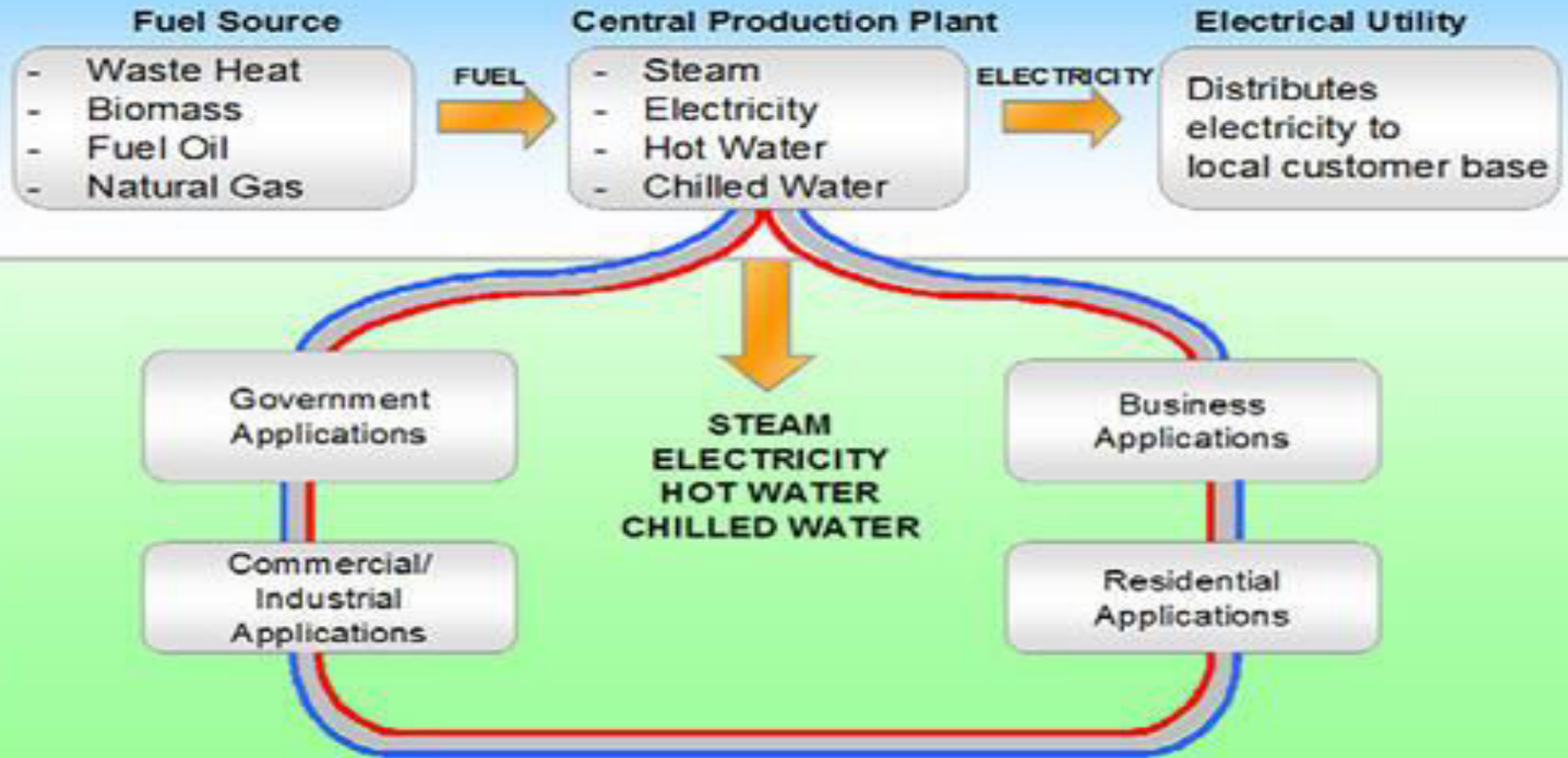
*DHC is an integrative technology that utilizes various environment-friendly sources to provide heating and cooling to consumers from a central plant through underground piping*



- Circulates hot/chilling water or low-pressure steam
- Potential sources include:
  - Combined Heat and Power (CHP) plants
  - biomass or biomass/coal co-firing
  - industrial waste heat

# DHC SYSTEM ARCHITECTURE

## Typical District Energy System





# DHC SUBSYSTEMS

- Energy production: heat plants or cogeneration plants (Combined Heat and Power - **CHP**).
  - In CHP electricity and useful heat are simultaneously produced by capturing waste heat
- Transportation and distribution piping network: Heat from thermal plants is transferred to consumers through a heat carrying fluid in supply pipes that returns to the source through return pipes after delivering the energy
- Consumers: domestic buildings, commercial buildings, industrial facilities, offices, and hospitals



# DHC BENEFITS

- District energy allows for a transition away from fossil fuel use and can result in a 30–50% reduction in primary energy consumption – reduction in GHG emissions
- Reductions in indoor and outdoor air pollution and the associated health impacts
- Greatly improves the operational efficiency of new or existing buildings
- Allow exploitation of local and renewable energy resources
- Higher fuel efficiency and more effective heat transfer capacity

# SMART DHC

- Intelligent management of the supply side with appropriate control mechanisms of integrated:
  - Thermal storage
  - Absorption refrigerators
  
- Balance of available heating/cooling with current demand considering:
  - Availability of stored energy
  - Waste heat from industry
  - Heat from CHP plants
  - Solar heat



# OUTLINE

TOPIC 1: Smart Energy Cities

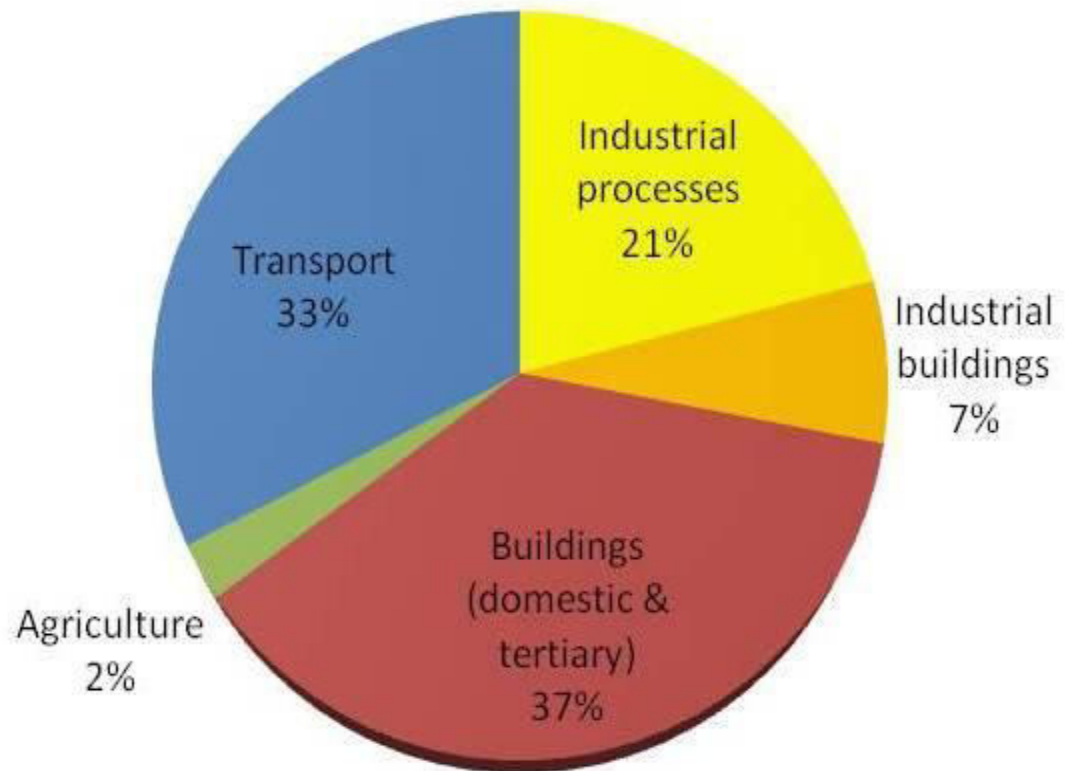
**TOPIC 2: Smart Energy in Buildings**

TOPIC 3: Smart Energy in Transport

# ENERGY AND BUILDINGS

- Buildings consume more than 40% of the world's total energy
- Heating, cooling and lightning are responsible for about 25% of the world's CO<sub>2</sub> emissions

Share of total EU energy consumption



# NEED FOR ENERGY-EFFICIENT BUILDINGS

- About 50% of the energy used is wasted due to inefficient lightning, HVAC and power infrastructures
- Energy demand is growing and the fastest growing energy demand sector is commercial buildings
- Green energy integration to achieve sustainability
- Studies suggest that massive energy savings can be achieved through ICT implementation:
  - Up to 75% for lightning – 5% of total building energy consumption
  - Up to 10% for heating, cooling – 7% of total building consumption
  - Up to 30% in public buildings



# SMART BUILDINGS

*“Smart buildings focus on minimizing energy usage and impacts in environment, while maximizing comfort, health, and safety.*

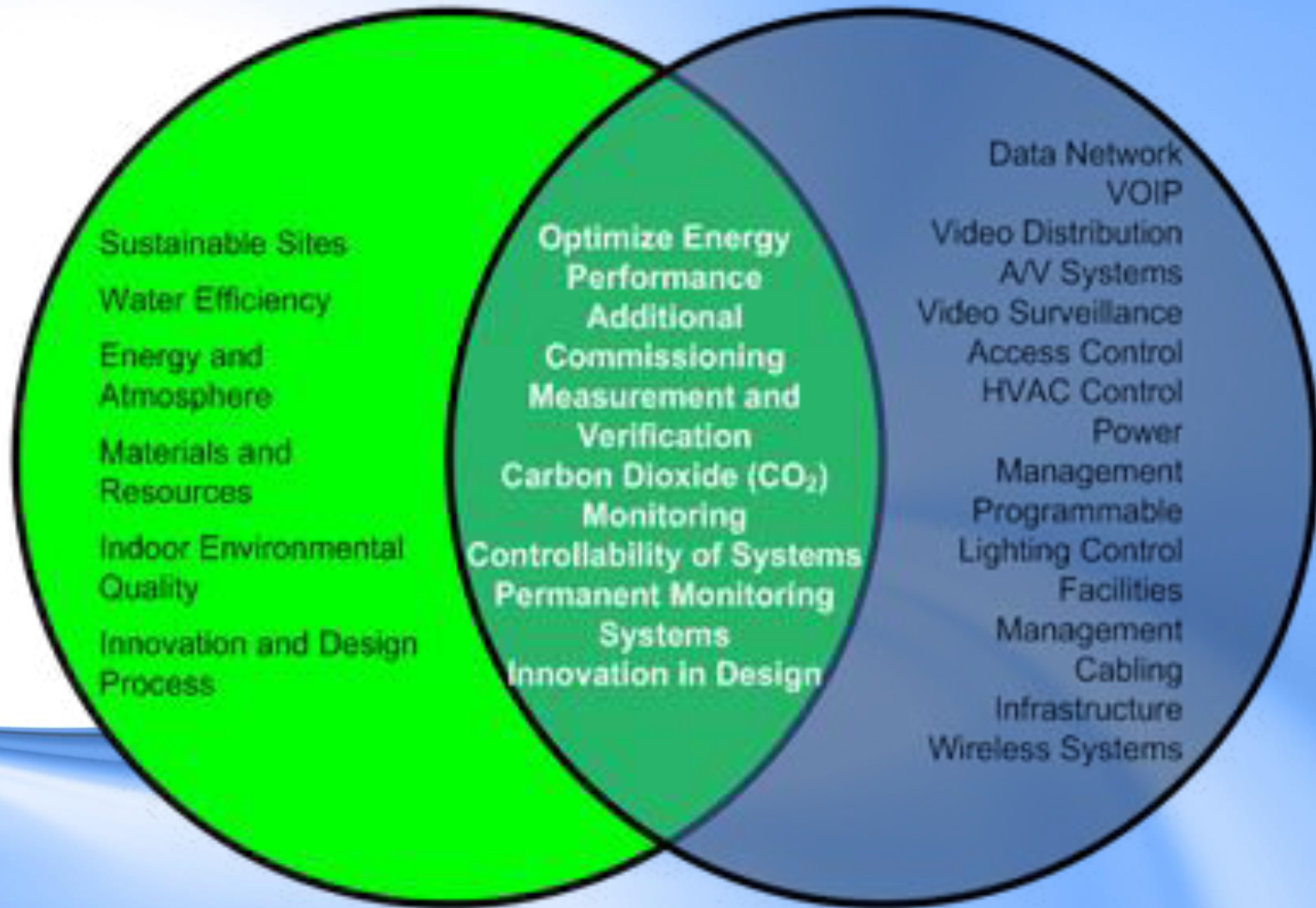
*They leverage technology to provide enhanced performance and are connected and responsive to the smart grid”*





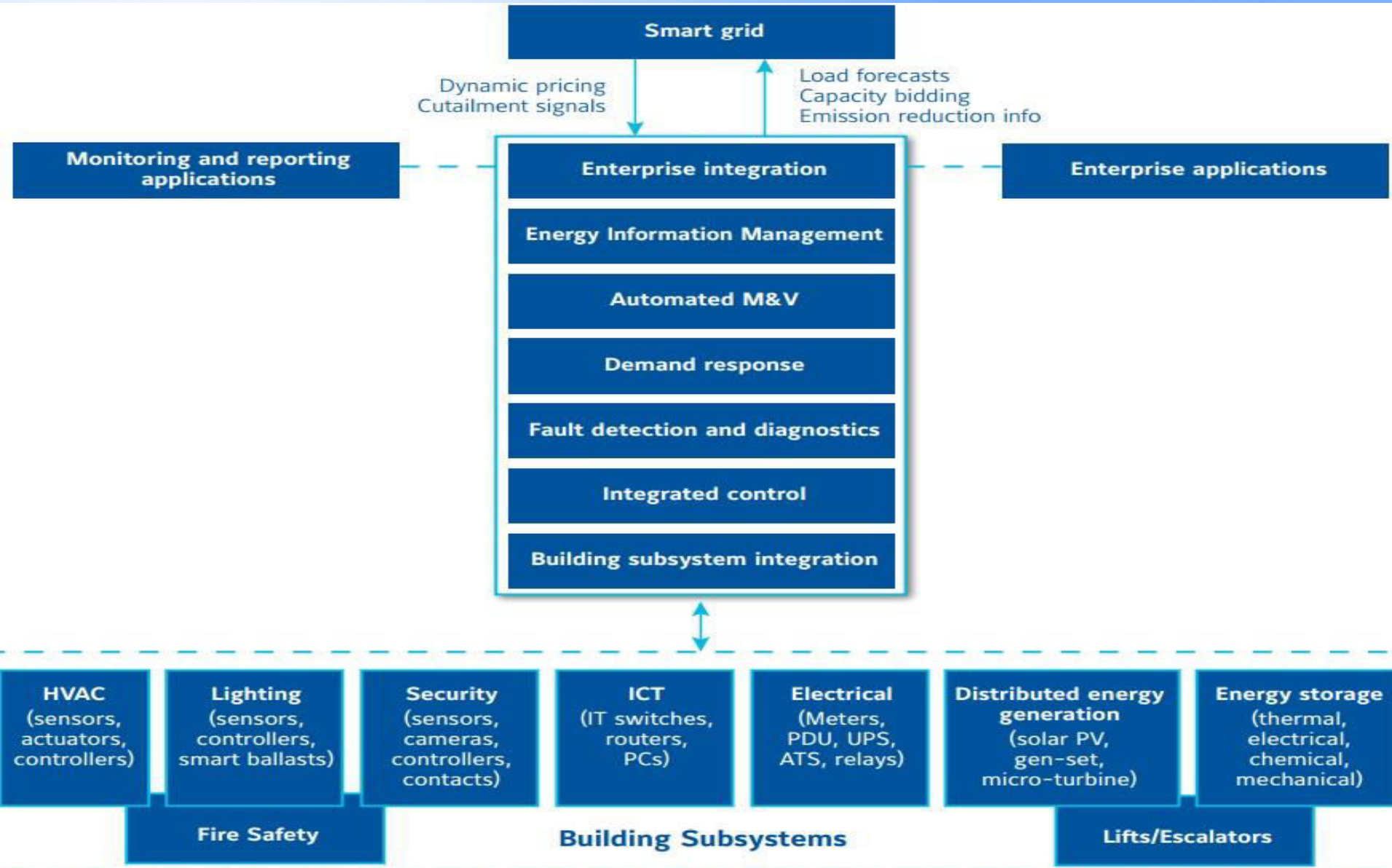
# THE COMMONALITY OF SMART AND GREEN BUILDINGS

**GREEN BUILDINGS**



**SMART BUILDINGS**

# ICTS FOR SMART BUILDINGS



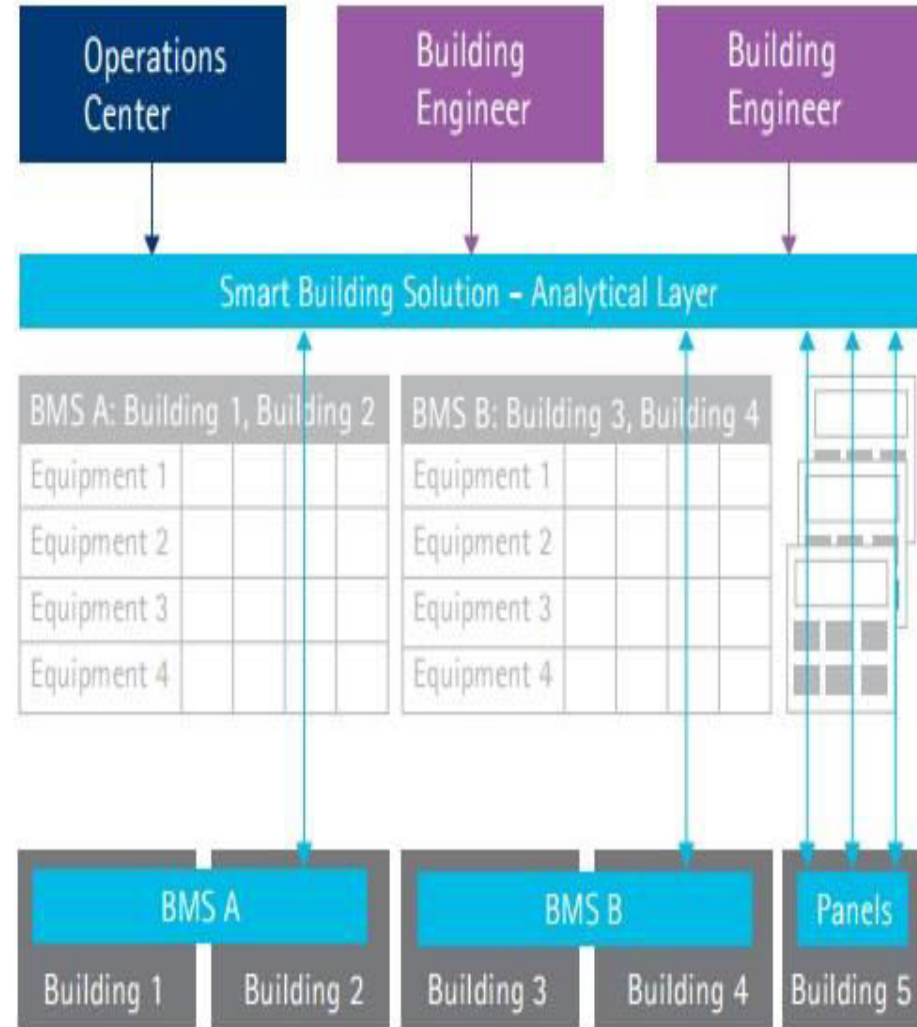
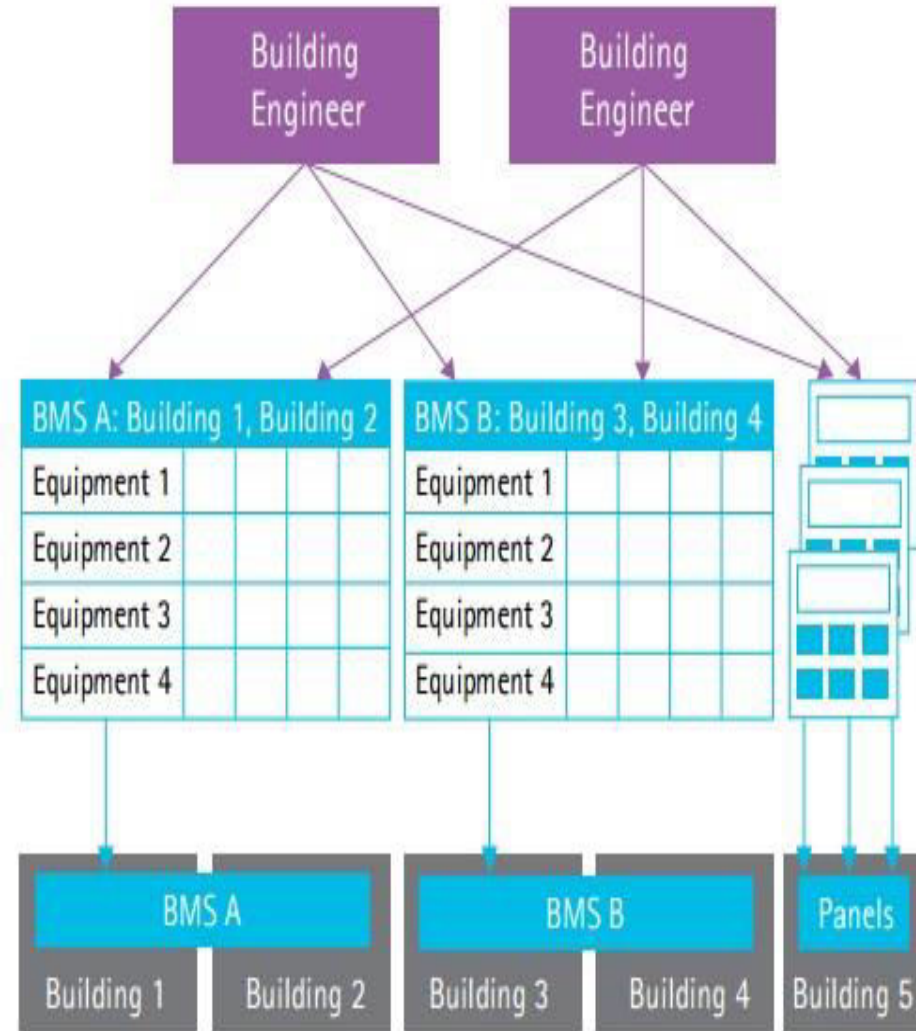
# BUILDING ENERGY MANAGEMENT SYSTEMS

- Integrated systems of software, hardware and services that control energy use through information and communication technology
- Monitoring, automating, and controlling building systems such as heating, ventilation, air conditioning, thermostats, and lighting
- Increase building energy efficiency and improve daily living comfort





# CONVENTIONAL VS INTELLIGENT BUILDINGS



# APPLICATIONS



# OUTLINE

TOPIC 1: Smart Energy Cities

TOPIC 2: Smart Energy in Buildings

**TOPIC 3: Smart Energy in Transport**



# ENERGY AND TRANSPORT

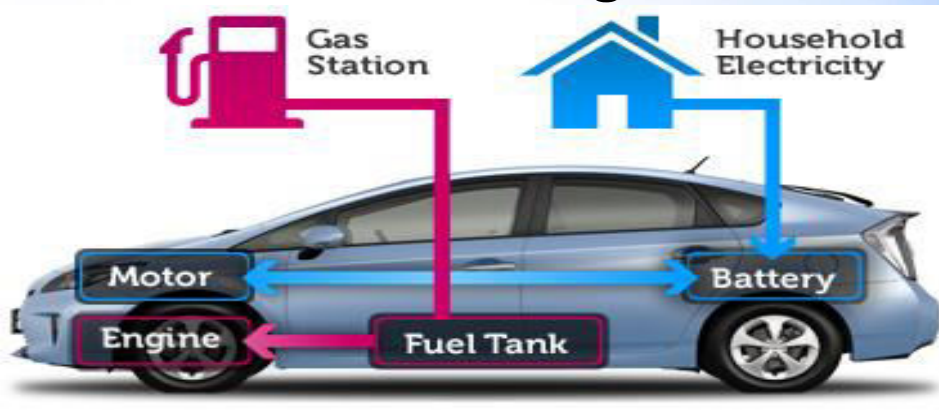
- 80% of the population living in urban areas
- Rising standards of living leading to increased individual mobility and, consequently, more vehicles
- Globalization of trade resulting in a constantly increasing international transport volume
- Demand for transport is dominated by fossil fuels
- Responsible for 31% of the energy consumption and for 21% of the GHG emissions
- Transport pollution up to 40% of GHG in the cities

# THE NEED FOR CHANGE

- Polluting combustion engines have to be replaced
- Renewable energy resources must be utilized
- New transportation infrastructures and methods are needed to reduce energy usage and associated pollution
- Intelligent energy is a crucial driver of the evolution of the transport sector
  - Non-polluting and highly-efficient vehicles: the **Electric Vehicles**
  - Vehicle energy **supply** will be provided via **smart grids** from clean and sustainable energy sources

# EV TYPES

## Hybrid EV with internal combustion engine



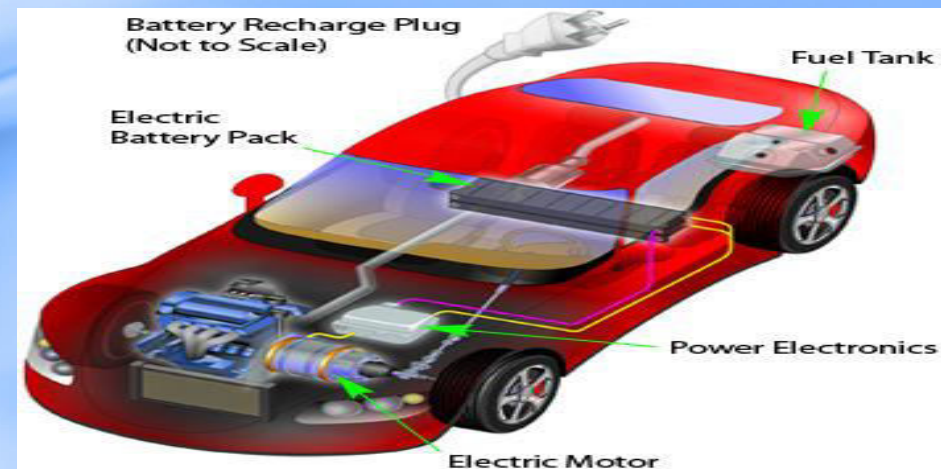
## On-Line Hybrid EV



## Plug-in EV

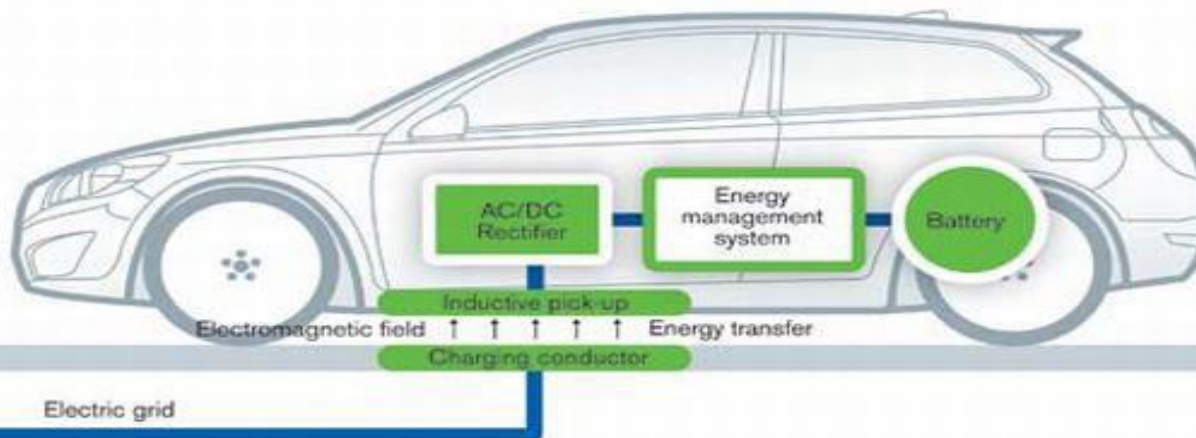


## Plug-in Hybrid EV



# CHARGING METHODS

**Via electric  
cable**



**Wireless  
charging –  
electromagnetic  
field**



# BARRIERS FOR ADOPTION

- Charging points' network is currently extremely limited both in terms of numbers and regional coverage
- Required time to charge vehicles is long – much longer when compared to gasoline
- The electricity charging infrastructure in its current form has inherently limited range
- EV and associated charging infrastructure deployment cost is high
- Reliability has not yet been thoroughly tested

# BIBLIOGRAPHY

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Rosen, M.A., Le, M.N., and Dincer, I. (2005). Efficiency analysis of a cogeneration and district energy system. Appl Thermal Eng, 25, 147–159

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<http://www.accenture.com/SiteCollectionDocuments/PDF/Accenture-Energy-Smart-Buildings.pdf>

<http://smartenergyefficiency.eu/tag/transport/>

Grob, G.R. (2009). Future Transportation with Smart Grids & Sustainable Energy SYSTEMICS, CYBERNETICS AND INFORMATICS, 7(5), 50-54



# IMAGE SOURCES

<http://www.smartmeters.com/sunpower-invests-tendrils-smart-energy-platform/>  
<http://ses.jrc.ec.europa.eu/smart-grid-cost-benefit-analysis>  
[http://www.ibm.com/smarterplanet/us/en/smarter\\_cities/overview/](http://www.ibm.com/smarterplanet/us/en/smarter_cities/overview/)  
<http://www.smart-cities.eu/>  
<http://www.tvilight.com/>  
[http://emsengineering.com/district\\_heating\\_\\_cooling.html](http://emsengineering.com/district_heating__cooling.html)  
<http://www.vitalenergi.co.uk/technologies/district-heating-cooling/>  
<http://www.solarmarstal.dk/>  
<http://www.technology4change.com/article.jsp?id=552#.VYk11CHtmko>  
<http://www.eereports.com/>  
<http://barkell.co.uk/web/hvac-controls/building-management-systems.htm>  
<http://www.nanowerk.com/news2/green/newsid=37546.php>  
<https://www.enocean.com/en/smart-home-and-home-automation/>  
[http://www.toyota.com.cn/innovation/environmental\\_technology/plugin\\_hybrid/](http://www.toyota.com.cn/innovation/environmental_technology/plugin_hybrid/)  
<http://www.earthtimes.org/environment/electric-cars/>  
<http://www.vacleancities.org/cleaner-transportation/electricity/hybrid-electric/plug-in-hybrid/>  
<http://www.plugincars.com/quick-guide-buying-your-first-home-ev-charger-126875.html>  
<http://www.ecofriend.com/wireless-charging-electric-cars.html>

***THANK YOU FOR YOUR ATTENTION!***





MODULU 4 – STUDJU TA' KAŻ

Titlu	Deskrizzjoni
Livell	
Semestru	
ECTS	1 (10 sigħat)
lingwa tat-tagħlim	
Numru ta' lectures	1
Numru ta' laboratorji	1
Homework	
Laqgħat / tutorja	
Għanijiet tal-kors	<ul style="list-style-type: none"> <li>• Id-differenzi bejn l-implimentazzjoni ta' miżuri ta' sostenibbiltà u s-sostenibbiltà bħala prinċipju</li> <li>• Kapacità li tagħmel differenza bejn is-sostenibbiltà f'intrapriżi kbar u żgħar / medji</li> <li>• Nifhmu l-istruttura tal-kumpaniji</li> <li>• Nifhmu l-importanza tal-klijenti u l-indirizzar tal-ħtiġijiet tagħhom</li> <li>• Għarfien tal-vantaġġi / żvantaġġi tal-implimentazzjoni tal-miżuri sostenibbli fin-negozju</li> </ul>
Kontenut tal-kors	Deskrizzjoni ta' studju ta' każ bbażat fuq l-eżempju ta' Philips Lighting. Il-mudell tan-negozju huwa deskritt. Philips joffri servizz minflok prodotti ta' dawl bi qbil ta' spiza fuq tul ta' żmien u mfassla għall-bżonnijiet tal-konsumatur. Barra minn hekk, il-benefiċċji ta' dawn il-miżuri huma deskritti kemm min-naħa tal-konsumatur u l-kumpanija kif ukoll mill-impatt ambjentali. Finalment, is-sewwieqa u l-ostakoli għall-mudell kummerċjali huma identifikati, li huma mmirati lejn kwistjonijiet ambjentali speċjali.
Valutazzjoni	L-istudenti huma mistiedna li jwieġbu domandi riflettivi, li huma mmirati lejn l-għarfien tagħhom tal-istudju każ kif ukoll fuq l-għarfien tagħhom tal-intraprenditorija ħadra b'mod ġenerali.



MODULU 4 – STUDJU TA' KAŻ

Titlu	Deskrizzjoni
Livell	
Semestru	
ECTS	1 (10 sigħat)
lingwa tat-tagħlim	
Numru ta' lectures	1
Numru ta' laboratorji	1
Homework	
Laqgħat / tutorja	
Għanijiet tal-kors	<ul style="list-style-type: none"> <li>• Id-differenzi bejn l-implimentazzjoni ta' miżuri ta' sostenibbiltà u s-sostenibbiltà bħala prinċipju</li> <li>• Kapacità li tagħmel differenza bejn is-sostenibbiltà f'intrapriżi kbar u żgħar / medji</li> <li>• Nifhmu l-istruttura tal-kumpaniji</li> <li>• Nifhmu l-importanza tal-klijenti u l-indirizzar tal-ħtiġijiet tagħhom</li> <li>• Għarfien tal-vantaġġi / żvantaġġi tal-implimentazzjoni tal-miżuri sostenibbli fin-negozju</li> </ul>
Kontenut tal-kors	Deskrizzjoni ta' studju ta' każ bbażat fuq l-eżempju ta' Philips Lighting. Il-mudell tan-negozju huwa deskritt. Philips joffri servizz minflok prodotti ta' dawl bi qbil ta' spiza fuq tul ta' żmien u mfassla għall-bżonnijiet tal-konsumatur. Barra minn hekk, il-benefiċċji ta' dawn il-miżuri huma deskritti kemm min-naħa tal-konsumatur u l-kumpanija kif ukoll mill-impatt ambjentali. Finalment, is-sewwieqa u l-ostakoli għall-mudell kummerċjali huma identifikati, li huma mmirati lejn kwistjonijiet ambjentali speċjali.
Valutazzjoni	L-istudenti huma mistiedna li jwieġbu domandi riflettivi, li huma mmirati lejn l-għarfien tagħhom tal-istudju każ kif ukoll fuq l-għarfien tagħhom tal-intraprenditorija ħadra b'mod ġenerali.



**HANDOUT – Modulu 4 – STUDJU TA' KAŻ**

<b>Introduzzjoni</b>	"Philips" hija impriza ewlenija u ta' suċċess fid-dinja kollha fl-oqsma ta' kura tas-saħħa, l-istil u dawl. L-eżempju deskritt hawn taħt huwa l-mudell tan-negozju fil-kuntest ta' Philips Lighting. L-għan huwa li jiġġenera għarfien ta' kif jaħdem il-mudell, kif qed jiġi mplimentat fil-kumpanija u x'impatti għandu għall-klijent, il-kumpanija u l-ambjent.
<b>Deskrizzjoni</b>	<p><b>Lezzjoni</b></p> <p>Fl-istudju tal-każ is-servizz ta' dawl ambjentali tal-kumpanija Philips huwa deskritt, billi jiffoka fuq il-mudell kummerċjali tagħha fir-rigward tal-effiċjenza fl-enerġija, ir-riċiklaġġ u r-relazzjonijiet tal-klijent fit-tul. F'dan il-mudell tan-negozju tal-kumpanija tipproduċi, tinstalla, tipperpetwa, tħares, tirriċikla u, sa ċertu punt, tagħmel użu mill-għid ta' materjali mis-sistema tad-dawl. Il-klijent iħallas biss hlas għas-servizz fuq perġodu miftiehem u għall-funzjoni u l-kwalità mixtieqa. Dan il-mudell, għandu tliet aspetti differenti minn mudelli ta' negozji tradizzjonali:</p> <ol style="list-style-type: none"> <li>1) Il-klijent jirċievi mhux biss prodott, imma servizz;</li> <li>2) Ir-relazzjoni bejn klijent u l-kumpanija nbidlet minn relazzjoni ta' bejgħ għal sħubija ta' servizz fdat; u</li> <li>3) Il-mudell tan-negozju għandu effett fuq it-trasferiment ta' fondi, li tinbidel minn hlas selettiv għal skema ta' pagament kontinwu.</li> </ol> <p><b>Laboratorju:</b></p> <p>L-istudenti huma mistiedna jiddiskutu individwalment jew fi gruppi d-domandi sussegwenti:</p> <ul style="list-style-type: none"> <li>• Liema huma l-aspetti li jinbidlu permezz tal-implimentazzjoni tal-mudell tan-negozju? Spjega l-isfidi ewlenin u kif dawn ġew indirizzati.</li> <li>• Hemm sitwazzjoni fejn jirbaħ kulhadd għall-kumpanija u għaliex / għaliex le?</li> <li>• Kif tista' tiġi deskritta l-motivazzjoni għall-implimentazzjoni ta' dan il-mudell u liema huma d-differenzi possibbli meta mqabbla għal SMEs start-up?</li> <li>• Spjega xi jrid jagħmel intraprenditur biex ikollu negozju ta' suċċess filwaqt li jibdel il-mudell tan-negozju.</li> </ul> <p><b>Assenjament:</b></p> <p>żur l-websajt tal-kumpanija u identifika l-indikaturi tal-valuri ekoloġiċi u soċjali u kif il-mudell tan-negozju jirrifletti dawk il-valuri. Huwa wkoll meħtieġ biex issir taf liema oqsma ekoloġiċi jkopru dawn il-miżuri u liema żoni tal-kumpanija li jaffettwaw.</p>
<b>Referenzi</b>	<p><b>APA style:</b></p> <p>Henriksen, Kristian/Bjerre, Markus/Damgaard Grann, Emil/Lindahl, Mattias/Suortti, Tuomo/ Friðriksson, Karl/ Mühlbradt, Tor/ Sand Henrik (2012): Green business model innovation. Business case study compendium. Nordic Innovation report. Oslo: Nordic Innovation</p>





**HANDOUT – Modulu 4 – STUDJU TA' KAŻ**

<b>Introduzzjoni</b>	"Philips" hija impriza ewlenija u ta' suċċess fid-dinja kollha fl-oqsma ta' kura tas-saħħa, l-istil u dawl. L-eżempju deskritt hawn taħt huwa l-mudell tan-negozju fil-kuntest ta' Philips Lighting. L-għan huwa li jiġġenera għarfien ta' kif jaħdem il-mudell, kif qed jiġi mplimentat fil-kumpanija u x'impatti għandu għall-klijent, il-kumpanija u l-ambjent.
<b>Deskrizzjoni</b>	<p><b>Lezzjoni</b></p> <p>Fl-istudju tal-każ is-servizz ta' dawl ambjentali tal-kumpanija Philips huwa deskritt, billi jiffoka fuq il-mudell kummerċjali tagħha fir-rigward tal-effiċjenza fl-enerġija, ir-riċiklaġġ u r-relazzjonijiet tal-klijent fit-tul. F'dan il-mudell tan-negozju tal-kumpanija tipproduċi, tinstalla, tipperpetwa, tħares, tirriċikla u, sa ċertu punt, tagħmel użu mill-ġdid ta' materjali mis-sistema tad-dawl. Il-klijent iħallas biss hlas għas-servizz fuq perjodu miftiehem u għall-funzjoni u l-kwalità mixtieqa. Dan il-mudell, għandu tliet aspetti differenti minn mudelli ta' negozji tradizzjonali:</p> <ol style="list-style-type: none"> <li>1) Il-klijent jirċievi mhux biss prodott, imma servizz;</li> <li>2) Ir-relazzjoni bejn klijent u l-kumpanija nbidlet minn relazzjoni ta' bejgħ għal sħubija ta' servizz fdat; u</li> <li>3) Il-mudell tan-negozju għandu effett fuq it-trasferiment ta' fondi, li tinbidel minn hlas selettiv għal skema ta' pagament kontinwu.</li> </ol> <p><b>Laboratorju:</b></p> <p>L-istudenti huma mistiedna jiddiskutu individwalment jew fi gruppi d-domandi sussegwenti:</p> <ul style="list-style-type: none"> <li>• Liema huma l-aspetti li jinbidlu permezz tal-implimentazzjoni tal-mudell tan-negozju? Spjega l-isfidi ewlenin u kif dawn ġew indirizzati.</li> <li>• Hemm sitwazzjoni fejn jirbaħ kulhadd għall-kumpanija u għaliex / għaliex le?</li> <li>• Kif tista' tiġi deskritta l-motivazzjoni għall-implimentazzjoni ta' dan il-mudell u liema huma d-differenzi possibbli meta mqabbla għal SMEs start-up?</li> <li>• Spjega xi jrid jagħmel intraprenditur biex ikollu negozju ta' suċċess filwaqt li jibdel il-mudell tan-negozju.</li> </ul> <p><b>Assenjament:</b></p> <p>żur l-websajt tal-kumpanija u identifika l-indikaturi tal-valuri ekoloġiċi u soċjali u kif il-mudell tan-negozju jirrifletti dawk il-valuri. Huwa wkoll meħtieġ biex issir taf liema oqsma ekoloġiċi jkopru dawn il-miżuri u liema żoni tal-kumpanija li jaffettwaw.</p>
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# CASE STUDY ON GREEN ENTREPRENEURSHIP: Philips Lighting

## The business model

“Philips” is a worldwide leading company and successful in areas of healthcare, lifestyle and lighting. The example described below is the business model in context of Philips Lighting. In this business model the company produces, installs, perpetuates, monitors, takes back and, to a certain extent, reuses materials from the lighting system. The customer only pays a service charge over an agreed period and for the function and quality wished for. Through this model, three aspects differ from a traditional business model:

- 1) The customer receives not only a product, but a service;
- 2) The relation between customer and company changes from a sales relation to a trusted service partnership that supplies and perpetuate lighting systems; and
- 3) The business model has an effect on the transfer of funds, which changes from a selective payment to a continuing payment scheme.

Henriksen et al. 2012., p. 62f.

The teaching language at the University of Malta is English and therefore the course content is being presented in the English language to be used by any Maltese students/learners.

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# CASE STUDY ON GREEN ENTREPRENEURSHIP: Philips Lighting

## Benefits and impacts

The environmental impacts of the business model can be traced to the type of lighting as it is an energy efficient LED system. Furthermore the system is monitored and metered, this means, that it can be optimised to fit the customer's needs. Finally the model solves the problem for closing materials loops - the return - logistics and finances.

The financial impacts of the described model is a “win-win” situation for both sides, the customers and the company. The customer benefits from the tailored service and stable costs, while at the same time reducing the down-payment needed for the installation of newest lightning systems. The company benefits from the long-term partnership with the customer. Furthermore the company gets back valuable raw materials in the product for reuse or selling.

Henriksen et al. 2012., p. 63

# CASE STUDY ON GREEN ENTREPRENEURSHIP: Philips Lighting

## Drivers and barriers

At Philips, sustainable innovation is mainly driven by the conviction that healthy and sustainable living requires social, economic and environmental preconditions. Furthermore, due to increasing environmental pollution companies have to respond to market requirements with a long-term commitment to sustainability.

From an economic point of view, a barrier is that the model only works with long-term relationships and financial focus as well as the commitment to the supplier from side of the customer.

From an environmental point of view, there are several barriers regarding actual closing of the material loop. Philips receives the materials, but material streams are not actual loops. Furthermore there are some technical challenges due to a lack of precise information about the actual contents of the recycled materials. Attached to this barrier is the fact that for many materials the cost of brand new ones is lower than the cost of collecting and recovering them.

Henriksen et al. 2012., p. 63

# CASE STUDY ON GREEN ENTREPRENEURSHIP: Philips Lighting

## Reflection questions

- What aspects change through the implementation of the business model?
- Explain the key challenges and how they are addressed.
- What environmentally friendly fields cover these measures and which areas of the company they affect?
- Is there a win-win situation for the company and why/why not?
- How can the motivation for implementing this model be described and what are possible differences in comparison to a green SME start-up?
- Discuss the ecological and social values and how the business model reflects those values.
- Explain what an entrepreneur has to do well to have a successful business venture while changing the business model.

# CASE STUDY ON GREEN ENTREPRENEURSHIP: Philips Lighting

## References

Henriksen et al. (2012): Green business model innovation. Business case study compendium. Nordic Innovation publications.





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# CASE STUDY ON GREEN ENTREPRENEURSHIP: Yalumba Wine Company

## The business model

Yalumba is a South Australian wine company with 200 local and 600 international employees. Its activities include grape growing, winemaking, packaging, distribution, marketing and sales. Yalumba's environmental management system is ISO certified and continuously focusing on reducing and monitoring its lifecycle impacts that may result from its business activities. The aim of environmental citizenship is to effectively communicating Yalumba's mindset, approach and commitment to sustainable winemaking to its stakeholders so that they will be effectively engaged.

Yalumba is using supply chain management working closely with its suppliers to help and encourage them to minimise their environmental impacts through adopting clean technology and best practice procedures. The company also takes an active part in the local community. The company keeps innovating by constantly evaluating and revising its production processes, supplier channels, packaging etc. to find the best solutions to a sustainable wine production and to encourage their customers to dispose the product packaging in a responsible manner.

Henriksen et al. 2012., p. 74 f.

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# CASE STUDY ON GREEN ENTREPRENEURSHIP: Yalumba Wine Company

## Benefits and impacts

Yalumba is very focused on minimising its materials use, carbon emissions and waste from packaging. They attempt to use alternative fuels, such as biodiesel, and renewable energy, such as solar power. In addition, Yalumba has developed its own specialised LCA, which is now used as standard for LCA in the New World wine industry.

Economic benefits and impacts are that Yalumba seek to balance its concerns for the environment and its social relations while still ensuring sufficient cash flow and profitability by producing a persistent above average return to shareholders.

Henriksen et al. 2012., p. 74f.

# CASE STUDY ON GREEN ENTREPRENEURSHIP: Yalumba Wine Company

## Drivers and barriers

Main drivers are that the winery's targeted focus on sustainability started with an in-house PhD thesis on the environmental impact of the company's organisational culture. This led to the recognition that Yalumba could achieve the greatest impact from strengthening their efforts on the social aspect of sustainability - by changing people's minds and behaviour. The greatest barrier has been people's lack of awareness about what it means to act in a sustainable way.

Henriksen et al. 2012., p. 74 f.



# CASE STUDY ON GREEN ENTREPRENEURSHIP: Yalumba Wine Company

## Reflection questions

- What is the success of the business model?
- What has been changed in the business model in order to guarantee sustainability?
- What is needed within a company in order to re-structure the business model in regard to sustainability and guarantee economic benefits?
- Think of ways to raise people's awareness regarding sustainable acting in business.



# CASE STUDY ON GREEN ENTREPRENEURSHIP: Yalumba Wine Company

## References

Henriksen et al. (2012): Green business model innovation. Business case study compendium. Nordic Innovation publications.



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# CASE STUDY ON GREEN ENTREPRENEURSHIP: Elvis & Kresse

## The business model

Elvis & Kresse's value proposition is to provide its customers with fashionable and durable life-style accessories with social and environmental meaning.

The innovativeness of Elvis & Kresse's business model lies in the fact that the company manufactures their products from waste streams that traditionally are not recyclable. This brings a deeper meaning to the products as they help to solve niche waste problems. In addition, the company donates 50% of all profits made on products from each of their associated waste streams to a charitable organisation associated with the waste. The company currently manufactures products from 10 waste streams, with the most important products being durable belts and bags in timeless designs and reusable and compostable shopping bags. Today the company also sells its products through major retailers and boutiques, as well as high-end retailers. Elvis & Kresse are characterised to have developed a special relationship with some of their customers.

Henriksen et al. 2012., p. 22f.

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# CASE STUDY ON GREEN ENTREPRENEURSHIP: Elvis & Kresse

## Benefits and impacts

The environmental benefits of Elvis & Kresse's business model stem from the fact that it reduces the amount of waste going to landfill. Since 2005 the company has prevented some 160 tonnes of waste from going to landfill.

In terms of finances, the business model and partnership structure have also lead to large benefits; both for Elvis & Kresse, but also for their waste, charity and sales partners. The waste generating partners save money because of not having to dispose of their waste. The waste associated charity partners benefit from Elvis & Kresse's profits, and sales partners benefit from the sales of Elvis & Kresse's products in their stores, e.g. Sainsbury currently sells 1,000 of Elvis & Kresse's shopping bags every week. All involved enjoy the associated PR value from upcycling waste to products and donating money to a charity, and Elvis & Kresse gain enormous marketing value in the process.

Henriksen et al. 2012., p. 22 f.



# CASE STUDY ON GREEN ENTREPRENEURSHIP: Elvis & Kresse

## Drivers and barriers

One of the two main drivers behind the success of Elvis & Kresse's business has been the waste partnerships. The other main driver behind the success of Elvis & Kresse has been the founders' personal commitment and motivation to avoid that waste goes to landfill.

One of Elvis & Kresse's main barriers was the almost immediate success of their business. When sales of their belts took off they were completely unprepared to meet the demand. Also, space for storing raw materials for new products was extremely limited and still poses a challenge for Elvis & Kresse's growth. Looking ahead towards the establishment of the Elvis & Kresse brand, another barrier was their limited knowledge about fashion, design and manufacturing. In all of these areas, Elvis & Kresse have literally relied on learning by doing.

Henriksen et al. 2012., p. 22 f.



# CASE STUDY ON GREEN ENTREPRENEURSHIP: Elvis & Kresse

## Reflection questions

- What are the strengths of the company?
- How do these affect the company's business model (positive and negative)?
- On a larger scale, how is risk taking linked to entrepreneurship?
- What can an entrepreneur do in order to take control of risks or support decision making?

# CASE STUDY ON GREEN ENTREPRENEURSHIP: Elvis & Kresse

## References

Henriksen et al. (2012): Green business model innovation. Business case study compendium. Nordic Innovation publications.



Thank you!



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# CASE STUDY ON GREEN ENTREPRENEURSHIP: Royal mosa

## The business model

Royal Mosa provide its customers with innovative high-quality ceramic products produced with high emphasis on design and sustainability through implementing the cradle to cradle philosophy. The company's innovation is thus reached by having a special Mosa design team with people directly from the design team working closely together with architects in developing new collections. As Mosa focus their business model on the professional markets, the two main focus groups are architects and corporate companies. In some countries, they also focus on housing companies.

They also continue to develop and implement Cradle to Cradle principles within the company's products and processes. CTC differentiates between a biological cycle and a technical cycle. In the biological cycle, products are produced from natural materials, which serve as food for organisms at the end of their use. However, as many products are not compostable and they are primarily suited to the technical cycle, Mosa has succeeded in making them unhazardous to the environment. Mosa use Lifecycle analysis to determine their products' lifecycle impact on the environment and where to reduce that impact.

Henriksen et al. 2012., p. 77 f.

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# CASE STUDY ON GREEN ENTREPRENEURSHIP: Royal mosa

## Benefits and impacts

Mosa have made significant impacts regarding materials and recipes as their tiles do not release any harmful compounds and do not damage the environment should they be dumped after use, and they are also recyclable.

Through a modernisation programme Mosa have succeeded in reducing their CO2 emissions with 48 percent as well as their particulate emissions with 91 percent. Mosa have also succeeded in closing a cooling water cycle resulting in a reduction of more than 60 percent of groundwater consumption. Besides making efforts to use as little energy as possible Mosa have also shifted to almost entirely using sustainable energy.

On short-term the company has in general broken even as a result of its green business model innovation. It is expected that the new activities will constitute a larger share of the turnover in the future and the companies now also benefits from being a more sustainable company and are better prepared for the future. Furthermore the new business model has led to the creation of five new jobs.

Henriksen et al. 2012., p. 77 f.



# CASE STUDY ON GREEN ENTREPRENEURSHIP: Royal mosa

## Drivers and barriers

A driver for Mosa was the belief that only sustainable companies will survive in the long run and that they would like to be a profitable company in the future as well.

Mosa still see Cradle to Cradle as relatively unknown. There is much emphasis on CO2, but the public are not wholly aware of the whole shortage of resources and the impact materials besides CO2 have on the environment. The financial crisis has resulted in some of Mosa's potential consumers to have a more short-term approach and only look at the price.

It has as well been a challenge to redevelop the products to live up to the C2C standards. It took more than two years of extended research and product development as well some out-of-pocket investments for tests, research and consultancy.

It has also proven difficult to make really valuable technical cycles, which Mosa are still working on and requires a lot of investment. This process needs involvement of all relevant actors and also requires almost accurate scientific calculations of the best solutions for creating sustainable products.

Henriksen et al. 2012., p. 77 f.

# CASE STUDY ON GREEN ENTREPRENEURSHIP: Royal mosa

## Reflection questions

- How are the products proceeded in order to explain the cradle to cradle approach of the business model?
- What are the (positive and negative) impacts of this sustainable business model?
- How are they related to economic success of the company?
- From an economic point of view, are the environmental benefits larger than the economic ones?
- What can be done in order to balance or guarantee success on both sides?

# CASE STUDY ON GREEN ENTREPRENEURSHIP: Royal mosa

## References

Henriksen et al. (2012): Green business model innovation. Business case study compendium. Nordic Innovation publications.



Thank you!



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Case Study  
Ġimgħa / week 40-42

Żviluppat minn / Developed by:  
Best-Institut für berufsbezogene Weiterbildung  
und Personaltraining





# CASE STUDY ON GREEN ENTREPRENEURSHIP: Eastex Material Exchange

## The business model

The Eastex Material Exchange is a web-based platform that facilitates the exchange of surplus materials between different parties. The value proposition of the Eastex Material Exchange is to make it possible for SME to find cheaper raw materials and equipment, or to exchange their surplus materials while contributing to lower waste generation.

The platform is free of charge to all members; a service which has mainly been financed through local government funding. Management was however handed over to a private community interest company called Bright Green in December 2010, with the aim of making the platform self-sustained.

The platform can also be used by public organisations, as well as social enterprises, charities and other types of organisations. In terms of key resources, the Eastex Materials Exchange platform has benefitted greatly from local government grants as well as cooperative efforts between the different counties that were involved with the project.

Henriksen et al. 2012., p. 65 f.

The teaching language at the University of Malta is English and therefore the course content is being presented in the English language to be used by any Maltese students/learners.

Il-lingwa tat-tagħlim fl-Università ta' Malta hija l-Ingliż u għalhekk il-kontenut tal-kors qed jiġi ppreżentat bil-lingwa Ingliża għal-użu tal-istudenti Maltin.



# CASE STUDY ON GREEN ENTREPRENEURSHIP: Eastex Material Exchange

## Benefits and impacts

The environmental impact of the Eastex Material Exchange stems from the material exchanges occurring through the platform and thereby material reuses.

In terms of finances, the material exchange helps its members to avoid waste disposal costs, including transportation costs and landfill taxes. Allowing platform members to obtain raw materials at cheaper prices compared to what would otherwise have been the case also saves money.

Henriksen et al. 2012., p. 65 f.

# CASE STUDY ON GREEN ENTREPRENEURSHIP: Eastex Material Exchange

## Drivers and barriers

The main driver for pursuing the Eastex Materials Exchange was the British government's focus on improving resource efficiency.

There have been three main barriers with regards to setting up the Eastex Material Exchange. The first was related to educating businesses to make use of the platform and explaining its potential. The second barrier was to make companies use the platform on a continued basis, which required several marketing campaigns. The third barrier has been that once companies joined as members in the material exchange and established a profitable relationship with a 'waste' partner, there would be a tendency for the companies to leave the platform.

Henriksen et al. 2012., p. 65 f.

# CASE STUDY ON GREEN ENTREPRENEURSHIP: Eastex Material Exchange

## Reflection questions

- Think of different dimensions, the model has a positive impact on the environment.
- If the model wasn't relying on public funding, what alternative funding options are there?
- How is the relationship between Eastex material exchange and companies?
- Please describe the importance of stakeholder involvement, especially for small Start-ups.
- What strategies are there in order to get relevant stakeholder on board and to guarantee a long-term relationship?

# CASE STUDY ON GREEN ENTREPRENEURSHIP: Eastex Material Exchange

## References

Henriksen et al. (2012): Green business model innovation. Business case study compendium. Nordic Innovation publications.



**Thank you!**



## O2 – Portafoll Ambjentali / Environmental portfolio

Kors / Course 3 – Intraprenditorija –  
Energija Intelligenti /  
Entrepreneurship-Intelligent energy

Modulu / Module 4 – Studju ta' Każ /  
Case Study  
Ġimgħa / week 43-45

Żviluppat minn / Developed by:  
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# CASE STUDY ON GREEN ENTREPRENEURSHIP: Siemens Building Technologies

## The business model

The value proposition of Siemens Building Technologies' performance contracting services is to provide customers with low-risk and self-financed energy saving solutions for large buildings and ships. The energy savings lead both to less money spent on energy consumption and lower CO2 emissions.

The innovative part of the business model is twofold. First of all, Siemens can provide its customers with a guarantee of meeting very specific energy saving targets by basing their solutions on proven technologies and specific knowhow in the area. If these savings are not met, Siemens will pay the difference to their customers. The investment therefore only carries a very small risk for the customer. And secondly, if savings are higher than estimated, the additional benefit is shared between Siemens and the customer. This creates an incentive for Siemens to strive for over-performance, and it motivates the customer to play an active role in helping to reduce energy consumption as much as possible to reap even larger benefits. As such, the performance contract also helps to facilitate close cooperation between Siemens and its customers, which is necessary for realising energy savings.

Henriksen et al. 2012., p. 58 f.

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# CASE STUDY ON GREEN ENTREPRENEURSHIP: Siemens Building Technologies

## Benefits and impacts

Siemens' energy saving solutions lead to significant economic gains in terms of increasing building values. For instance, a building which has much lower operation costs than similar buildings is of much more value to potential renters. For this reason, building owners may set higher net rents, hence increasing the net revenue and financial efficiency of invested capital. In addition, energy saving solutions can increase a company's environmental image and CSR profile. Up until recently, the value derived from this source has mostly been seen as a spillover effect, but its merit and importance is increasing significantly.

Henriksen et al. 2012., p. 58 f.

# CASE STUDY ON GREEN ENTREPRENEURSHIP: Siemens Building Technologies

## Drivers and barriers

The overall driver of Siemens' energy saving solutions relates to what the company refers to as a specific 'megatrend'; namely, the ongoing population growth coupled with the increase in urbanisation and the rising demand for energy. Today, cities represent 80 per cent of the world's CO2 emissions but only 50 per cent of the world's population. In the future, the city populations will grow, as well the need for energy, and this means a growing market for the performance contracting services that Siemens offers. Likewise, rapid technological developments make it possible to deliver solutions with higher and higher energy savings, providing a foundation for energy savings services of a more continuous nature, i.e. cycles over a 10-year period for a given building.

Obstacles may arise from diverting interests between owners and renters of the building to which the energy saving solution is applied. The benefits of lower energy consumption will be reaped by the renters, leaving the obvious question; who should take on the investment, the owner or the renter?

# CASE STUDY ON GREEN ENTREPRENEURSHIP: Siemens Building Technologies

## Reflection questions

- What is the company's ambition to introduce this change of business model?
- How can its introduction be managed internally?
- What are the resources of the company?
- How is the external view of the company concerned?
- What are the impacts of this external views and internal recourses in view of the business model?
- What are the main differences in comparison to an SME?
- How is the owner-renter discrepancy addressed?

# CASE STUDY ON GREEN ENTREPRENEURSHIP: Siemens Building Technologies

## References

Henriksen et al. (2012): Green business model innovation. Business case study compendium. Nordic Innovation publications.



Thank you!



**KORS IV - Sistemi ta' Ġestjoni tal-Energija Applikati f'organizzazzjonijiet (inklużi skejjel)**

Module	Content	Teaching method
<b>Modulu 1:</b> Energija tal-Bini / Organizzazzjoni 3 ECTS	<b>Suġġett 1:</b> Definizzjonijiet ta' terminoloġija komuni tal-enerġija u s-sorsi ta' enerġija <b>Suġġett 2:</b> Xejriet tal-enerġija fl-UE <b>Suġġett 3:</b> Prijoritajiet tal-enerġija tal-UE u l-istrateġiji tal-iffrankar tal-enerġija	eLearn
<b>Modulu 2:</b> Standards u Direttivi tal- Energija 3 ECTS	<b>Suġġett 5:</b> Direttivi tal-enerġija <b>Suġġett 6:</b> Standards tal-enerġija u l-Benefiċċji mill-implimentazzjoni EnMS	eLearn
<b>Modulu 3:</b> Sistemi ta' Ġestjoni tal- Energija 3 ECTS	<b>Suġġett 8:</b> Il-proċess Plan-Do-Check-Act <b>Suġġett 9:</b> Tekniki ta' monitoraġġ / ippjanar / ġestjoni tal-enerġija u Qafas ta' Trasferiment tal-għarfien EE <b>Suġġett 10:</b> Implimentazzjoni ta' EnMS fi ħdan organizzazzjoni	laqgħa
<b>Field Work</b> 6 ECTS	Diżinn ta' sistema EnMS fi ħdan skola	proġett

**KORS IV**  
**Sistemi ta' Ġestjoni tal-Energija Applikati f'organizzazzjonijiet (inklużi skejjel)**

Modulu 1: Energija tal-Bini / Organizazzjoni

Titlu	Deskrizzjoni
<b>Livell</b>	
<b>Semestru</b>	
<b>ECTS</b>	3 (90 sigħat)
<b>lingwa tat-tagħlim</b>	Ingliz
<b>Numru ta' lectures</b>	1
<b>Numru ta' laboratorji</b>	xejn
<b>Xogħol tad-dar</b>	<p>Assenjament 1: Tqabbil ta' tendenzi tal-enerġija fost l-Istati Membri. Konsum ta' enerġija, id-dipendenza fuq il-fjuwils mhux rinnovabbli, persentaġġ ta' sorsi rinnovabbli, miżuri għall-effiċjenza implimentati, eċċ</p> <p>Assenjament 2: Analizi dwar l-istatus f'kull Stat Membru f'kull qasam ta' priorità tal-enerġija tal-UE għall-effiċjenza enerġetika.</p>
<b>Laqgħat / tutorja</b>	Tista' tintalab laqgħa waħda fl-istadju tal-assenjazzjoni.
<b>Għanijiet tal-kors</b>	<ul style="list-style-type: none"> <li>Familjarizzazzjoni mat-terminoloġija komuni tal-enerġija.</li> <li>Diskussjoni dwar sorsi ta' enerġija li ma jigggeddux u l-effetti tagħhom fuq is-soċjetà</li> <li>Jinissel għarfien ta' teknoloġiji ta' enerġija rinnovabbli.</li> <li>Familjarizzazzjoni mat-tendenzi tal-enerġija fl-UE.</li> <li>Reviżjoni u fehim tal-oqsma prijoritarji tal-enerġija tal-UE.</li> <li>Familjarizzazzjoni ma' strategiji li jiffrankaw l-enerġija tal-UE fl-Istati Membri.</li> </ul>
<b>Kontenut tal-kors</b>	<ul style="list-style-type: none"> <li>Definizzjonijiet ta' terminoloġija tal-enerġija.</li> <li>Sorsi ta' enerġija (rinnovabbli u mhux rinnovabbli).</li> <li>Tendenzi tal-konsum tal-Energija fl-UE.</li> <li>Ewropa miri tal-2020 u l-oqfsa ta' appoġġ.</li> </ul>
<b>Valutazzjoni</b>	<p>Assenjament Finali: Identifikazzjoni u d-diskussjoni tal-aħjar prattiki fl-Istati Membri tal-UE biex jikkontribwixxu għall-kisba tal-għanijiet stabbiliti mill-KE fiż-żona ta' priorità fl-effiċjenza enerġetika.</p>

## Modulu 2: Standards u Direttivi tal-Energija

Titlu	Deskrizzjoni
<b>Livell</b>	
<b>Semestru</b>	
<b>ECTS</b>	3 (90 sigħat)
<b>lingwa tat-tagħlim</b>	Ingliz
<b>Numru ta' lectures</b>	1
<b>Numru ta' laboratorji</b>	xejn
<b>Xogħol tad-dar</b>	<p>Assenjament 1: Rapport dwar l-istatus tal-implimentazzjoni għall-miżuri ewlenin tad-Direttiva Effiċjenza Energija 2012 bejn erba' Stati Membri tal-għażla tiegħek, li tenfasizza tal-anqas Stat Membru wieħed li mar lil hinn mir-rekwiżiti tal-effiċjenza enerġetika mistqarra mid-direttiva.</p> <p>Assenjament 2: Rapport dwar l-istatus tal-implimentazzjoni għad-Direttiva dwar l-Energija Rinnovabbli madwar tliet Stati Membri tal-għażla tiegħek. Identifika kwalunkwe prattiki li jwasslu għall-devoluzzjoni tad-direttiva.</p>
<b>Laqgħat / tutorja</b>	Tista' tintalab laqgħa waħda fl-istadju tal-assenjazzjoni.
<b>Għanijiet tal-kors</b>	<ul style="list-style-type: none"> <li>Għarfien tad-direttivi tal-enerġija varji u standards disponibbli.</li> <li>Fehim tar-rekwiżiti tal-ISO 50001.</li> <li>Diskussjoni u spjegar tal-għan u l-benefiċċji ta' EnMS.</li> </ul>
<b>Kontenut tal-kors</b>	<ul style="list-style-type: none"> <li>2012 Energy Efficiency Directive</li> <li>EU Energy Labelling Directive</li> <li>Ecodesign Directive</li> <li>2010 Energy Performance of Buildings Directive</li> <li>Renewable Energy Directive</li> <li>ISO14001:2001 – Environmental Management Systems</li> <li>ISO 9001:2008 – Quality Management Systems</li> <li>EMAS – Eco-Management and Audit Scheme</li> <li>ISO 50001:2011 – Energy Management Systems</li> <li>benefiċċji EnMS għall-organizzazzjoni</li> </ul>
<b>Valutazzjoni</b>	<p>Assenjament Finali: Diskussjoni dwar id-direttivi u l-istandards differenti pprezentati; l-applikabbiltà tagħhom, vantaġġi u l-iżvantaġġi, komplementarjetajiet u differenzi.</p>

### Modulu 3: Sistemi ta' Ġestjoni tal-Energija

Titlu	Deskrizzjoni
<b>Livell</b>	
<b>Semestru</b>	
<b>ECTS</b>	3 (90 sigħat)
<b>lingwa tat-tagħlim</b>	Ingliz
<b>Numru ta' lectures</b>	2
<b>Numru ta' laboratorji</b>	xejn
<b>Xogħol tad-dar</b>	<p>Assenjament 1: Deskrizzjoni tal-proċess PDCA għall-implimentazzjoni ta' EnMS f'xenarju ġeneriku.</p> <p>Assenjament 2: Ikteb proposta indirizzata lill-amministrazzjoni ta' organizzazzjoni biex tadvoka għall-implimentazzjoni ta' EnMS. Iddeskrivi l-benefiċċji kollha li l-organizzazzjoni tista' tiegħu vantaġġ minnhom, l-opportunitajiet li jipprezentaw f'termini ta' vantaġġi kompetittivi u għalfejn inti għandek tkun maħtura bħala l-manijer tal-enerġija għat-teħid tal EnMS mid-disinn sa l-implimentazzjoni u l-operazzjoni.</p>
<b>Laqgħat / tutorja</b>	Tista' tintalab laqgħa waħda fl-istadju tal-assenjazzjoni.
<b>Għanijiet tal-kors</b>	<ul style="list-style-type: none"> <li>• Tivvaluta l-karatteristiċi tal-prestazzjoni tal-enerġija għal bini / zona partikolari.</li> <li>• Tiżviluppa politika għall-użu aktar effiċjenti tal-enerġija fil-bini / zona.</li> <li>• Tiżviluppa miri u għanijiet biex tassisti biex jintlaħaq l-politika.</li> <li>• Użu ta' dejta biex jifhmu aħjar u jieħdu deċiżjonijiet dwar l-użu tal-enerġija u l-konservazzjoni tal-enerġija.</li> <li>• Tissorvelja u tkejjel l-konsum tal-enerġija u l-enerġija iffrankata.</li> <li>• Reviżjoni tal-politika mfassla.</li> <li>• Titjib Kontinwu tal-politiki ta' ġestjoni tal-enerġija, miri u sistemi ta' monitoraġġ.</li> <li>• Disinn ta' oqfsa għat-trasferiment tal-għarfien fl-effiċjenza enerġetika.</li> <li>• Kunfidenza fil-passi involuti sabiex jimplimentaw EnMS fi ħdan organizzazzjoni</li> </ul>
<b>Kontenut tal-kors</b>	<ul style="list-style-type: none"> <li>• Plan-Do-Check-Act process.</li> <li>• Tekniċi ta' monitoraġġ dwar l-Energija.</li> <li>• Ippjanar tal-Energija għall tnaqqis tal-konsum.</li> <li>• dokumentazzjoni ġestjoni Energija.</li> <li>• Qafas ta' trasferiment tal-għarfien fl-effiċjenza Enerġetika.</li> <li>• Passi biex timplimenta EnMS.</li> </ul>
<b>Valutazzjoni</b>	<p>assenjazzjoni finali:</p> <p>Diskussjoni dwar ir-rekwiżiti ewlenin għal implimentazzjoni b'suċċess ta' EnMS billi jkunu kkunsidrati l-aspetti ta' kontroll, ippjanar, id-dokumentazzjoni u t-trasferiment tal-għarfien. Identifika Karatteristiċi vitali ta' tħaddim tajjeb flimkien mal-benefiċċji li kull waħda tipprezenta.</p>

#### MODULU 4 – FIELD WORK

Titlu	Deskrizzjoni
Livell	
Semestru	
ECTS	6 (180 sigħat)
lingwa tat-tagħlim	Ingliz
Numru ta' lectures	xejn
Numru ta' laboratorji	xejn
Xogħol tad-dar	xejn
Laqgħat / tutorja	Laqgħa interim wieħed biex jikkontrolla l-progress u jinkiseb feedback u gwida ulterjuri jekk ikun meħtieġ.
Għanijiet tal-kors	Biex jitqiegħdu fil-prattika s-sugġetti kollha koperti fil-Moduli 1, 2 u 3 permezz tal-analiżi u l-interpretazzjoni ta' studju stabbilit fi skola. L-istudent irid jipproduċi d-dokumentazzjoni, rapporti ta' analiżi, għodod ta' monitoraġġ, oqfsa trasferiment tal-għarfien u l-pjanijiet ta' żmien neċessarja għall-implimentazzjoni ta' struttura EnMS fi ħdan l-iskola dettaljat fl-field work.
Kontenut tal-kors	xogħol ta' Field Work
Valutazzjoni	xogħol ta' Field Work

## KORS IV - Sistemi ta' Ġestjoni tal-Energija Applikati f'organizzazzjonijiet (inkluzi skejjel)

<b>Introduzzjoni</b>	<p>Fid-dawl tad-dipendenza dejjem tikber tad-dinja fuq id-disponibbiltà tal-enerġija, il-ħtieġa għall-ġestjoni tal-enerġija issa qed jinħass aktar minn qatt qabel. Huwa essenzjali li niffrankaw fl-użu tal-enerġija sabiex:</p> <ul style="list-style-type: none"> <li>▪ Innaqqsu l-ħsara li qed nagħmlu fuq il-pjaneta tagħna</li> <li>▪ Innaqqsu d-dipendenza tagħna fuq fjuwils fossili li huma limitati fil-provvista</li> </ul> <p>Il-ġestjoni tal-enerġija hija l-muftieħ għall-iffrankar l-enerġija. Ħafna mill-importanza tal-iffrankar tal-enerġija ġejja mill-bżonn globali - din il-ħtieġa globali taffettwa l-prezzijiet tal-enerġija, il-miri tal-emissjonijiet, u l-leġiżlazzjoni, li kollha jwasslu għal diversi raġunijiet għala organizzazzjoni għandha tagħmel ħilitha biex jitnaqqas il-konsum tal-enerġija tagħha.</p> <p>It-tnaqqis fuq il-konsum tal-enerġija għandu wkoll benefiċċji oħra direttament relatati mal-organizzazzjoni nnifisha. Dawn huma:</p> <ul style="list-style-type: none"> <li>▪ tnaqqis fl-ispejjeż u l-enerġija</li> <li>▪ inqas emissjonijiet tal-karbonju u l-ħsara ambjentali li huma jikkawżaw filwaqt li jippromwovi immaġni ħadra u sostenibbli tal-organizzazzjoni</li> <li>▪ tnaqqis tar-riskju minħabba l-possibiltà ta' żidiet fil-prezzijiet tal-enerġija jew nuqqas ta' provvista ta' enerġija li jistgħu jaffettwaw serjament il-profittabbiltà u s-sopravivenza ta' organizzazzjoni</li> </ul> <p>Sistemi ta' ġestjoni tal-Energija (EnMS) huma essenzjali għall-kontroll tal-konsum tal-enerġija u biex jintlaħqu l-miri ta' effiċjenza tal-enerġija. Fl-aħħar ta' dan il-kors l-istudenti se jkunu jistgħu jippromwovu u jimplimentaw sistemi EnMS fi kwalunkwe stabbiliment organizzattiv. Meta wieħed iqis il-bidla lejn modi aktar effiċjenti fl-enerġija tal-operat fi ħdan l-industrija, bini pubbliku, uffiċċji, eċċ dan il-kors għandu l-għan li jippermetti lill-istudent li jidhlu fid-dinja tax-xogħol bil-ħiliet meħtieġa għall-ġestjoni EnMS.</p>
<b>Deskrizzjoni tal-kariga</b>	<p>EnMS huwa proċess kontinwu ta' identifikazzjoni, pjanar u implimentazzjoni ta' titjib fil-mod kif organizzazzjoni tuża l-enerġija. EnMS olistiku jibni fuq il-valur tan-negożju billi jirrikonoxxi l-importanza tal-konservazzjoni tal-enerġija bħala prinċipju essenzjali tan-negożju, u billi jistabbilixxi l-proċessi dejjiema għall-monitoraġġ u jinkisbu l-aħjar prattiki fl-użu tar-riżorsi tal-enerġija.</p> <p>L-implimentazzjoni effettiva ta' EnMS se tipprovdi l-qafas li jagħti riżultati dwar l-oġettivi tal-enerġija tal-organizzazzjoni. EnMS fih proċessi kontinwi u jeħtieġ li jiġu ttrattati bħala tali. Konsegwentement, il-monitoraġġ u l-aġġornament kontinwu tal-miżuri implimentati huwa dmir.</p> <p>Dan il-kors huwa bbażat fuq il-qafas tal-ISO 50001:2011 u jimmira li jinkariga lill-istudenti bil-ħiliet neċessarji biex ikunu jistgħu jargumentaw favur l-konservazzjoni tal-enerġija permezz ta' ġestjoni tal-enerġija, sabiex jevalwaw l-karatteristiċi tal-prestazzjoni ta' bini / organizzazzjoni, u jiżviluppaw politika u struttura. Dawn huma passi meħtieġa għal EnMS effettiv.</p> <p>Il-kors huwa maqsum f'4 moduli:</p> <ul style="list-style-type: none"> <li>▪ Modulu 1: L-ENERĠIJA</li> </ul> <p>Dan il-modulu hu l-introduzzjoni għall-sorsi varji ta' enerġija disponibbli flimkien mal-effetti tagħhom fix-xenarju globali. L-istat tat-tendenzi tal-konsum tal-enerġija fl-Ewropa se jkunu diskussi u analizzati fid-dawl tal-</p>



	<p>prijoritajiet u l-miri tal-enerġija tal-UE.</p> <ul style="list-style-type: none"> <li>▪ Modulu 2: ENERĠIJA POLITIKI &amp; STANDARDS Id-diversi dokumenti ewlenin li jirregolaw jew humw linja gwida fuq l-enerġija se jkunu koperti f'dan il-modulu flimkien ma' enfazi fuq il-benefiċċji ewlenin miksuba minn organizzazzjoni meta jinvestu fihom nfushom billi jikkontrollaw, inaqqsu u jimmoniterjaw il-konsum tal-enerġija tagħhom. Fost l-oħrajn, id-dokumenti koperti huma: <ul style="list-style-type: none"> <li>• ISO14001: 2001 - Sistemi ta' Ġestjoni Ambjentali</li> <li>• ISO 9001: 2008 - Sistemi ta' Ġestjoni tal-Kwalità</li> <li>• EMAS – Skema ta' Eko-Ġestjoni u Verifika</li> <li>• ISO 50001: 2011 - Sistemi ta' Ġestjoni tal-Enerġija</li> </ul> </li> <li>▪ Modulu 3: SISTEMI TA' ĠESTJONI TAL-ENERĠIJA Ibbażat fuq il-qafas provdut mill-istandard ISO 50001, dan il-modulu jipprepara lill-istudent biex ifassal u jimplimenta EnMS għal organizzazzjoni / bini. L-istudenti se jiġu mgħallma l-hiliet neċessarji għall-għbir u interpretazzjoni tad-data ta' konsum tal-enerġija, li jidentifikaw u jikkwantifikaw opportunitajiet biex jiffrankaw l-enerġija, jimmiraw għal tnaqqis f'dawk l-opportunitajiet u jsegwu kwalunkwe iffrankar tal-enerġija.</li> <li>▪ Modulu 4: XOGHOL FIL-QASAM (field work) Inqiegħdu fil-prattika s-suġġetti kollha koperti fil-Moduli 1,2 u 3 permezz tal-iżvilupp ta' EnMS fi ħdan ambjent ta' skola.</li> </ul>
Referenzi	<p><b>ISO 50001:2011 sistemi ta' ġestjoni tal-Enerġija - Rekwiżiti bi gwida għall-użu 2011 - Organizzazzjoni Internazzjonali għall-Istandardizzazzjoni</b>  <a href="http://www.iso.org/iso/catalogue_detail?csnumber=51297">http://www.iso.org/iso/catalogue_detail?csnumber=51297</a>  Dan l-istandard volontarju jipprovdi gwida u rekwiżiti għall EnMS. Huwa maħsub biex jistabbilixxi qafas validu fis-setturi kollha tal-ekonomija, u jgħin biex tinholoq trasparenza u jippromwovi l-aħjar Prattika fis-sistemi ta' ġestjoni tal-enerġija. Dan l-istandard huwa utli għall-persunal responsabbli għat-tfassil u l-implimentazzjoni ta' EnMS u fi kwalunkwe tip u daqs ta' organizzazzjoni.</p> <p><b>Manwal: Gwida għall-implimentazzjoni ta' ġestjoni tal-enerġija 2007 - Enerġija Intelliġenti - Ewropa (IEE)</b>  <a href="http://www.ee-ip.org/theme/post/energy-management/iee-library-bess-handbook-step-step-guidance-implementation-energy">http://www.ee-ip.org/theme/post/energy-management/iee-library-bess-handbook-step-step-guidance-implementation-energy</a>  Il-manwal jipprovdi qafas għall-implimentazzjoni ta' EnMS, inklużi aspetti kemm organizzattivi u tekniċi. Din ir-riżorsa hija mmirata lejn l-SMEs u huwa rilevanti bejn is-setturi multipli.</p> <p><b>Nagħmlu l-Każ tan-Negozju għal Proġett ta' Tnaqqis tal-Karbonju 2009 - Trust tal-Karbonju Renju Unit</b>  <a href="http://www.carbontrust.com/resources/guides/carbon-footprinting-and-reporting/making-the-business-case-for-a-carbon-reduction-project">http://www.carbontrust.com/resources/guides/carbon-footprinting-and-reporting/making-the-business-case-for-a-carbon-reduction-project</a>  Proponenti ta' proġetti ta' tnaqqis tal-karbonju ta' spiss jiltaqgħu ma' kwistjonijiet inerenti meta jippruvaw li jkollhom proġetti tal-enerġija u tal-karbonju approvati għall-implimentazzjoni. Dan id-dokument jistaqsi mistoqsijiet li jgħinu lill-qarrej jiddetermina min jagħmel id-deċiżjonijiet fl-organizzazzjoni u kif jimpenjaw ruħhom ma' dawn il-partijiet interessati. Id-dokument jiddiskuti kif tibni każ ta' negozju, inkluż: meta wieħed iqis finanza u r-riskju, jikkompetu għall-fondi, u l-</p>

	<p>abbozzar / ippreżentar ta' proposti tan-negozju.</p> <p><b>Mill Isfel sa Fuq: Prassi Aħjar fl-Effiċjenza Enerġetika fin-Negozju- Pew Center dwar it-Tibdil fil-Klima Globali</b></p> <p><a href="http://www.c2es.org/docUploads/PEW_EnergyEfficiency_FullReport.pdf">http://www.c2es.org/docUploads/PEW_EnergyEfficiency_FullReport.pdf</a></p> <p>Dan ir-rapport jiddokumenta l-istrateġiji ta' effiċjenza ta' ħafna kumpaniji, li jiddistillaw l-aħjar prattiki u li jipprovdu gwida flimkien ma' riżorsi għal negozji oħra.</p>
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**KORS IV - Sistemi ta' Ġestjoni tal-Energija Applikati f'organizzazzjonijiet (inklużi skejjel)**  
**Modulu 1: Energija tal-Bini / Organizzazzjoni**

<b>Introduzzjoni</b>	<p>L-għan ta' dan il-modulu hu li jipprovdi sfond ġenerali dwar il-kwistjonijiet u fatturi li huma l-forza wara l-effiċjenza enerġetika u miżuri għall-iffrankar tal-enerġija. Dan l-għarfien huwa neċessarju sabiex wieħed ikun f'pożizzjoni li jadvoka għall-implimentazzjoni ta' Sistemi ta' Ġestjoni tal-Energija fi kwalunkwe xenarju ta' organizzazzjoni jew bini.</p> <p>Fost l-oħrajn, id-dipendenza fuq il-fjuwils fossili għall-ġenerazzjoni tal-enerġija, l-emissjonijiet ta' gassijiet b'effett ta' serra, is-sorsi ta' enerġija u l-effetti tagħhom fuq il-pjaneta tagħna, l-istatistika tas-sistema tal-enerġija tal-UE kif ukoll l-istrateġija UE 2020, b'enfasi partikolari fuq il-politiki relatati mal-enerġija huma ppreżentati u diskussi.</p>
<b>Deskrizzjoni tal-kariga</b>	<p>Modulu 1 huwa maqsuma fi tliet temi li jitrattaw sfond ġenerali fuq il-konsum tal-enerġija, termini tal-enerġija, l-istatus attwali ta' tendenzi tal-enerġija fi ħdan l-Istati Membri tal-UE u t-triq 'il quddiem lejn it-tnaqqis ta' emissjonijiet tal-gassijiet b'effett serra kif iddettat mill-istrateġija UE 2020.</p> <p><b>Suġġett 1: Definizzjonijiet ta' terminoloġija komuni tal-enerġija u s-sorsi ta' enerġija</b></p> <p>Fit-trattament tal-effiċjenza enerġetika u l-isforzi li jiffrankaw l-enerġija, wieħed għandu l-ewwel jifhem it-terminoloġija bażika użata meta wieħed jirreferi għall-konsum tal-enerġija, l-effiċjenza enerġetika, l-intensità enerġetika, l-intensità tal-użu tal-enerġija, il-konservazzjoni tal-enerġija u l-ġestjoni tal-enerġija. Dan is-suġġett jispjega kull wieħed mit-termini li japplikaw għan-implimentazzjoni ta' Sistemi ta' Ġestjoni tal-Energija.</p> <p>Fi ħdan dan is-suġġett, sorsi ta' enerġija huma kklassifikati fi Rinnovabbli u Mhux Rinnovabbli. Sorsi mhux rinnovabbli huma promossi u l-istudenti huma pprovdut ukoll bil-hiliet neċessarji biex ikunu jistgħu jagħzlu s-sorsi ta' enerġija l-aktar adatti għal xenarji partikolari.</p> <p><b>Suġġett 2: Xejriet tal-enerġija fl-UE</b></p> <p>Peress li kull wieħed mill-Istati Membri tal-UE-28 m'għandhomx l-istess tendenzi ta' konsum tal-enerġija u kollha jiddependu fuq konfigurazzjonijiet differenti ta' eġġun ta' enerġija, dawn ma jistgħux jiġu ttrattati bħala blokk wieħed komplut meta niġu għall-isforzi ta' iffrankar tal-enerġija. Dan is-suġġett jippreżenta x-xejriet tal-konsum tal-enerġija għal kull Stat Membru, is-sehem individwali tagħhom ta' sorsi ta' enerġija rinnovabbli u l-emissjonijiet ta' gass b'effett ta' serra globali.</p> <p><b>Suġġett 3: Prijoritajiet tal-enerġija tal-UE u l-istrateġiji tal-iffrankar tal-enerġija</b></p> <p>Sal-2020, l-UE għandha l-għan li tnaqqas l-emissjonijiet tal-gassijiet b'effett ta' serra b'20%, tiżdied is-sehem tal-enerġija rinnovabbli għal mill-inqas 20% tal-konsum, u jinkiseb iffrankar tal-enerġija ta' 20% jew aktar. Il-pajjiżi kollha tal-UE iridu jiksibu wkoll sehem ta' 10% ta' enerġija rinnovabbli fis-settur tat-trasport tagħhom.</p> <p>Permezz tal-kisba ta' dawn il-miri, l-UE tista' tgħin fil-ġlieda kontra t-tibdil fil-klima</p>

	<p>u t-tniġġis, tnaqqas id-dipendenza tagħha fuq il-fjuwils fossili barranin, u żżomm l-enerġija bi prezz raġonevoli għall-konsumaturi u n-negozji. Dan is-sugġett jippreżenta l-politika tal-enerġija tal-UE 2020 b'mod dettaljat flimkien ma' għarfien dwar id-deċiżjoni ta' kondiviżjoni tal-isforzi li jinvolvi l-Istati Membri.</p>
<b>Referenzi</b>	<p>Depożitarju tan-NEEAPs kollha għall-Istati Membri  <a href="https://ec.europa.eu/energy/en/topics/energy-efficiency/energy-efficiency-directive/national-energy-efficiency-action-plans">https://ec.europa.eu/energy/en/topics/energy-efficiency/energy-efficiency-directive/national-energy-efficiency-action-plans</a></p> <p>Europa 2020 – websajt uffiċjali  <a href="http://ec.europa.eu/europe2020/index_en.htm">http://ec.europa.eu/europe2020/index_en.htm</a></p> <p>Renewable Energy Technology Roadmap 20% by 2020 ippubblikat mill-EREC, European Renewable Energy Council  <a href="http://www.erec.org/fileadmin/erec_docs/Documents/Publications/Renewable_Energy_Technology_Roadmap.pdf">http://www.erec.org/fileadmin/erec_docs/Documents/Publications/Renewable_Energy_Technology_Roadmap.pdf</a></p>

**KORS IV - Sistemi ta' Ġestjoni tal-Energija Applikati f'organizzazzjonijiet (inklużi skejjel)**  
**Modulu 2: Standards u Direttivi tal-Energija**

<b>Introduzzjoni</b>	<p>L-akbar porzjon tas-sorsi ta' enerġija tal-Ewropa ġejjin mill-fjuwils fossili li huwa s-sors ewlieni tat-tniġġis tal-arja u emissjonijiet tal-karbonju. Dan jimplika li parti sostanzjali tal-baġit ta' kull pajjiż huwa allokat għall-importazzjoni tal-fjuwils u dan jagħmel il-prezzijiet tal-elettriku tal-UE fost l-oġġla fid-dinja.</p> <p>Mod irħos u aktar nadif biex jintlaħqu l-bżonnijiet tal-enerġija tal-Ewropa huwa billi jkun hemm infrastruttura ta' prodotti aktar effiċjenti fl-enerġija. Dan huwa l-għan wara d-direttivi u l-istandards tal-UE li jmxexxi l-effiċjenza tal-enerġija u l-utilizzazzjoni ta' enerġija inqas bħala passaġġ biex tiżdied il-kompetittività u l-indipendenza tal-provvista tal-enerġija Ewropew filwaqt li jitnaqqas il-gass b'effett ta' serra (GHG) u jinthares is-saħħa umana u ambjentali.</p> <p>Id-<b>direttivi tal-UE</b> huma atti legali li jeħtieġu lill-Istati Membri jiksbu riżultat partikolari mingħajr ma jiddettaw l-mezzi sabiex jintlaħqu dawn ir-riżultati. Direttivi normalment iħallu ċertu ammont ta' libertà lill-Istati Membri fir-rigward tar-regoli eżatti li għandhom jiġu adottati permezz ta' varjetà ta' proċeduri legiżlattivi li jiddependu fuq il-materja tas-suġġett tagħhom.</p> <p><b>Standard</b> huwa dokument li jipprovdi rekwiżiti, speċifikazzjonijiet, linji gwida jew karatteristiċi li jistgħu jintużaw b'mod konsistenti biex jiġi żgurat li l-materjali, prodotti, proċessi u servizzi huma adattati għall-iskop tagħhom.</p>
<b>Deskrizzjoni tal-kariga</b>	<p>Modulu 2 jintroduċi d-direttivi u l-istandards relatati mal-ġestjoni tal-enerġija u l-utilizzazzjoni varji tal-UE.</p> <p><b>Suġġett 5: Direttivi tal-enerġija</b></p> <ul style="list-style-type: none"> <li>▪ 2012 Energy Efficiency Directive</li> <li>▪ 2010 Energy Performance of Buildings Directive</li> <li>▪ EU Energy Labelling Directive</li> <li>▪ Ecodesign Directive</li> <li>▪ Renewable Energy Directive</li> </ul> <p><b>Suġġett 6: Standards tal-enerġija u l-Benefiċċji mill-implimentazzjoni EnMS</b></p> <ul style="list-style-type: none"> <li>▪ ISO 9001:2008 Quality Management Systems</li> <li>▪ EMAS Eco-Management and Audit Scheme</li> <li>▪ ISO 14001:2004 Environmental Management System</li> <li>▪ ISO 50001:2011 Energy Management System</li> </ul> <p>Dan is-suġġett jippreżenta l-vantaġġi globali li jiġu esperjenzati minn organizzazzjoni wara l-implimentazzjoni tas-sistemi ta' enerġija u ta' ġestjoni ambjentali ggwidati mill-istandards ISO 50001:2011 u ISO 14001:2004.</p>
<b>References</b>	<p><b>Direttiva 2012/27 / UE tal-Parlament Ewropew u tal-Kunsill tal-25 t'Ottubru 2012 dwar l-effiċjenza enerġetika, li temenda d-Direttiva 2009/125 / KE u 2010/30 / UE u li tħassar id-Direttivi 2004/8 / KE u 2006/32 / KE Test b'rilevanza għaż-ŻEE</b>  <a href="http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1399375464230&amp;uri=CELEX:32012L0027">http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1399375464230&amp;uri=CELEX:32012L0027</a></p> <p><b>Direttiva 2010/31 / UE tal-Parlament Ewropew u tal-Kunsill tad- 19 Mejju 2010</b></p>

	<p><b>dwar il-prestazzjoni tal-enerġija tal-bini .</b>  <a href="http://eur-lex.europa.eu/legal-content/EN/ALL/;ELX_SESSIONID=FZMjThLLzfxmmMCQGp2Y1s2d3TjwD8QS3pqdKhXZbwqGwlgY9KN!2064651424?uri=CELEX:32010L0031">http://eur-lex.europa.eu/legal-content/EN/ALL/;ELX_SESSIONID=FZMjThLLzfxmmMCQGp2Y1s2d3TjwD8QS3pqdKhXZbwqGwlgY9KN!2064651424?uri=CELEX:32010L0031</a></p> <p><b>Direttiva 2010/30 / UE tal-Parlament Ewropew u tal-Kunsill tad- 19 Mejju 2010 dwar l-indikazzjoni permezz ta 'ttikkettar u informazzjoni standard tal-konsum tal-enerġija u riżorsi oħra minn prodotti marbutin mal-enerġija.</b>  <a href="http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32010L0030">http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32010L0030</a></p> <p><b>DIRETTIVA 2009/125 / KE TAL-PARLAMENT EWROPEW U TAL-KUNSILL tal-21 ta Ottubru 2009 li tistabbilixxi qafas għall-iffissar ta 'rekwiżiti għall-ekodisinn għal prodotti relatati mal-enerġija (riformulazzjoni)</b>  <a href="http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:285:0010:0035:en:PDF">http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:285:0010:0035:en:PDF</a></p> <p><b>Id-Direttiva 2009/28 / KE tal-Parlament Ewropew u tal-Kunsill tat-23 t'April 2009 dwar il-promozzjoni tal-użu tal-enerġija minn sorsi rinnovabbli u li temenda u sussegwentement tħassar id-Direttivi 2001/77 / KE u 2003/30 / KE</b>  <a href="http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32009L0028">http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32009L0028</a></p>
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**KORS IV - Sistemi ta' Ġestjoni tal-Energija Applikati f'organizzazzjonijiet (inklużi skejjel)**  
**Modulu 3: Sistemi ta' Ġestjoni tal-Energija**

<b>Introduzzjoni</b>	<p>L-użu effiċjenti tal-enerġija jgħin lill-organizzazzjonijiet jiffrankaw l-flus kif ukoll biex jikkonservaw ir-riżorsi u jindirizzaw il-bidla fil-klima. Dan il-kors jispjega l-iżvilupp ta' sistemi ta' ġestjoni tal-enerġija (EnMS) kif speċifikat fl-istandard ISO50001. Dan l-istandard huwa applikabbli għall-organizzazzjonijiet kollha fis-setturi kollha u jagħmilha possibbli għall-organizzazzjoni biex tintegra l-ġestjoni tal-enerġija fl-isforzi operattivi globali sabiex itejbu l-kwalità u ġestjoni ambjentali.</p> <p>Permezz ta' proċess gradwali, dan il-kors jipprovdi gwida dwar kif jiġi implimentat EnMS mibni fuq l-ISO 50001. Il-kors jippermetti lill-organizzazzjonijiet li jstabilixxu s-sistemi u l-proċessi meħtieġa biex itejbu l-prestazzjoni tal-enerġija, l-effiċjenza enerġetika, u jgħin sabiex jitnaqqas il-konsum u l-ispejjeż tal-enerġija.</p> <p>Ir-rekwiżiti tal-istandard se jiġu riveduti, filwaqt li jittiehed approċċ ta' implimentazzjoni pass wara pass. Il-kors jinkludi gwida fuq l-iżvilupp ta' pjan ta' implimentazzjoni, il-ħolqien tad-dokumentazzjoni neċessarja, il-monitoraġġ tas-sistema ta' ġestjoni tal-enerġija u l-kisba ta' titjib kontinwu fil-prestazzjoni tal-enerġija.</p>
<b>Deskrizzjoni tal-kariga</b>	<p><b>Suġġett 8: Il-proċess Plan-Do-Check-Act</b></p> <p>ISO 50001 jiffoka fuq proċess ta' titjib kontinwu sabiex jintlaħqu l-għanijiet relatati mal-prestazzjoni ambjentali ta' organizzazzjoni / bini. Il-proċess isegwi erba' fażijiet tal-approċċ Plan Do-Check-Act (PDCA). Kull fażi hi spjegata fid-dettall mal-linji gwida għall-implimentazzjoni.</p> <p><b>Suġġett 9: Tekniki ta' monitoraġġ / ippjanar / ġestjoni tal-enerġija u Qafas ta' Trasferiment tal-għarfien EE</b></p> <p>L-attivitajiet ta' monitoraġġ huma l-qalba tal-EnMS li jgħinu lill-manigġers tal-enerġija jkun f'pożizzjoni li jevalwaw il-prestazzjoni tal-enerġija u jtejjbuha. Dan it-topik jagħti gwida u rekwiżiti għal attività ta' sorveljanza sod li se jippermettu l-implimentazzjoni b'suċċess tal-EnMS.</p> <p>Dan is-suġġett jagħti sett ta' linji gwida u l-komponenti essenzjali li huma meħtieġa għal proċeduri ta' ppjanar adegwati għall-kontroll tat-tħaddim, l-akkwist ta' servizzi / prodotti li jikkunsmaw l-enerġija, id-disinn ta' prodotti godda u trattar ta' nuqqasijiet ta' konformità.</p> <p>L-istandard ISO 50001 jelenka sett ta' tnax-il document li huma essenzjali għaċ-ċertifikazzjoni ISO. Id-dokumenti huma ppreżentati flimkien mal-linji gwida għall-ħolqien u l-manutenzjoni fi hdan l-organizzazzjoni.</p> <p>Is-suċċess ta' proposta ta' pjan ta' azzjoni EnMS jiddependi fuq implimentazzjoni effettiva minn kull persuna fit-tim ta' ġestjoni tal-enerġija u l-appoġġ ta' l-organizzazzjoni. Dan is-suġġett jiddiskuti t-twaqqif ta' qafas ta' trasferiment tal-għarfien biex jassisti fit-trasferiment tal-għarfien fl-organizzazzjoni li tinkludi wkoll il-komunikazzjoni ma' korpi esterni.</p> <p><b>Suġġett 10: Implimentazzjoni ta' EnMS fi hdan organizzazzjoni</b></p> <p>Bħal kull standard ieħor, iċ-ċertifikazzjoni hija possibbli iżda mhux obligatorja. Dan is-suġġett jippreżenta l-benefiċċji ta' ċertifikazzjoni formali u dak li huwa meħtieġ sabiex ikunu jistgħu jilħqu l-istat ta' ċertifikazzjoni.</p>
<b>Referenzi</b>	<b>ISO 50001:2011 sistemi ta' ġestjoni tal-Energija - Rekwiżiti bi gwida għall-użu</b>

	<p><b>2011 - Organizzazzjoni Internazzjonali għall-Istandardizzazzjoni</b>  <a href="http://www.iso.org/iso/home/standards/management-standards/iso50001.htm">http://www.iso.org/iso/home/standards/management-standards/iso50001.htm</a></p> <p><b>Ġewwa l-Energija: L-iżvilupp u Ġestjoni ta' Sistema ISO 50001 Ġestjoni tal-Energija, C. Eccleston, F. March &amp; T. Cohen - ISBN: 13: 978-1-4398-7671-8</b></p>
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**KORS IV - Sistemi ta' Ġestjoni tal-Energija Applikati f'organizzazzjonijiet (inklużi skejjel)**  
**Module 4: Field Work**

<b>Introduzzjoni</b>	<p>Matul l-istadju finali tal-Kors IV, permezz ta' perjodu ta' apprendistat ta' xahar, l-istudenti huma meħtieġa jiżviluppaw EnMS għal intrapriża jew skola.</p> <p>Permezz tal-użu tas-sugġetti u l-informazzjoni kollha koperta fil-Moduli 1, 2 u 3 l-istudent għandu jwettaq il-kompiti deskritti hawn taħt assoċjati ma' dan il-modulu.</p>
<b>Deskrizzjoni tal-kariga</b>	<p>L-istudent irid jipproduċi d-dokumentazzjoni, rapporti ta' analiżi, għodod ta' monitoraġġ, oqfsa ta' trasferiment tal-għarfien u l-pjanijiet ta' żmien għall-implimentazzjoni ta' struttura neċessarja fi ħdan l-atmosfera dettaljat fl-istudju każ. Karatteristiċi li għandhom jiġu koperti mill-istudent matul l-implimentazzjoni tal-fażi apprendistat huma:</p> <ul style="list-style-type: none"> <li>• <b>Tinġholoq Politika dwar l-Energija:</b> stqarrija uffiċjali tal-impenn tal-organizzazzjoni għall-ġestjoni tal-enerġija.</li> <li>• <b>Jitfassal Pjan ta' Ġestjoni tal-Energija</b> li teħtieġ il-kejl, il-ġestjoni, u d-dokumentazzjoni għal titjib kontinwu għall-effiċjenza enerġetika.</li> <li>• <b>Jinġatar tim ta' ġestjoni</b> mmexxija minn rappreżentant li jirrapporta direttament lill-organizzazzjoni u li huwa responsabbli li jissorvelja l-implimentazzjoni tal-pjan strateġiku.</li> <li>• <b>Jiddefinixxi kontrolli u proċeduri tal-operat</b> biex jiġu indirizzati l-aspetti kollha ta' xiri tal-enerġija, l-użu u r-rimi.</li> <li>• <b>Jistabbilixxi linja bażi</b> tal-użu tal-enerġija tal-organizzazzjoni. Il-progress se jitkejjel kontra dan il-bażi .</li> <li>• <b>Jidentifika indikaturi tal-prestazzjoni tal-enerġija</b> li huma uniċi għall-organizzazzjoni u huma ssorveljati biex jitkejjel il-progress.</li> <li>• <b>Jiddefinixxi objettivi tal-enerġija u l-miri għat-titjib</b> fil-prestazzjoni tal-enerġija fil-funzjonijiet, livelli, proċessi jew faċilitajiet rilevanti fl-organizzazzjoni.</li> <li>• <b>Jitfasslu pjanijiet ta' azzjoni</b> biex jintlaħqu dawk il-miri u l-għanijiet.</li> <li>• <b>Jinġholoq manwali / rapporti meħtieġa</b>, dawn id-dokumenti kollha jevolvu maż-żmien.</li> <li>• <b>Jistabbilixxi rappurtar perijodiku</b> dwar il-progress tal-ġestjoni bbażat fuq il-kejl.</li> <li>• <b>Jitwaqqaf Qafas ta' Trasferiment tal-Għarfien</b> li jkun il-bażi tal-ippjanar u l-operazzjonijiet.</li> </ul>
<b>References</b>	<ul style="list-style-type: none"> <li>▪ <b>ISO 50001 Każ ta' Studju - Aviva Stadium</b>  <a href="https://www.linkedin.com/pulse/iso-5001-case-study-aviva-stadium-adam-faughnan?trk=seokp_posts_primary_cluster_res_title">https://www.linkedin.com/pulse/iso-5001-case-study-aviva-stadium-adam-faughnan?trk=seokp_posts_primary_cluster_res_title</a></li> <li>▪ <b>Simulazzjoni għall-Appoġġ tal-ISO 50001 Sistemi ta' ġestjoni tal-Energija u Sejbien u Dijanjożi ta' Faults: Każ ta' Studju tal-Malpensa Airport, KARTA KONFERENZA · Awissu 2013</b>  <a href="http://www.researchgate.net/profile/Luis_Blanes_Restoy/publication/256839494_Simulation_to_Support_ISO_50001_Energy_Management_systems_and_Fault_Detection_and_Diagnosis_Case_Study_of_Malpensa_Airport/links/00b7d53c7e5b08590f000000.pdf">http://www.researchgate.net/profile/Luis_Blanes_Restoy/publication/256839494_Simulation_to_Support_ISO_50001_Energy_Management_systems_and_Fault_Detection_and_Diagnosis_Case_Study_of_Malpensa_Airport/links/00b7d53c7e5b08590f000000.pdf</a></li> <li>▪ <b>Energy Management fl-Intrapriżi kbar: Studju fil-Qasam</b></li> </ul>

	<a href="http://cel.mie.utoronto.ca/wp-content/uploads/CEL09-01-EM-in-Large-Enterprises.pdf">http://cel.mie.utoronto.ca/wp-content/uploads/CEL09-01-EM-in-Large-Enterprises.pdf</a>
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# Kors: Sistemi Applikati ta' Ġestjoni tal-Energija f'/għall-organizzazzjonijiet (inklużi skejjel)

Course Portfolio: Applied Energy Management Systems in/for  
organisations (including schools)



O2: Portafoll Ambjentali / Environmental Portfolio

Kors żviluppati minn / Course developed by: Projects in Motion (Malta)

Koordinatur tal-proġett / Project Coordinator: University of Ioannina (Greece)

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# Course Content

- Module 1 – Building / Organisation Energy
  - Topic 1: Definitions of common energy terminology
  - Topic 2: Energy sources
  - Topic 3: Energy trends within the EU
  - Topic 4: EU energy priorities and energy saving strategies
- Module 2 – Energy Standards & Directives
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# Who Should Attend?

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- Managers of SMEs with schools as a primary focus.
- Employees responsible for energy management
- Those interested in improving energy performance and energy efficiency
- Individuals who want to learn more about ISO 50001.
- Individuals who want to implement an ISO 50001 EMS.
- Energy managers and energy coordinators (engineers, plant managers, etc.)

## Pre-requisites

- There are no formal prerequisites for this course

# Module 1

## Building / Organisation Energy

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Topic 1

# DEFINITIONS OF COMMON ENERGY TERMINOLOGY

- **Energy Consumption**

The amount of energy used by a process or system, or by an organization or society, in order to achieve a desired output.

- **Energy Efficiency**

Refers to the reduction in the amount of energy required to provide a given product / service using less energy.



- **Energy Intensity**

The measure of the energy efficiency of a country calculated as units of energy per unit of GDP

- **Energy Use Intensity (EUI)**

The measure that determines a building's energy performance, i.e. the quantity of energy consumed by a building relative to its size expressed in kWh/m<sup>2</sup>/year

EUI could also be used to quantify the performance of smaller target areas, e.g. for an appliance in kWh/appliance/year

- **Energy Conservation**

The reduction in the amount of energy consumed in a process or system, or by an organisation or society, through economy, elimination of waste and rational use.

- **Energy Management**

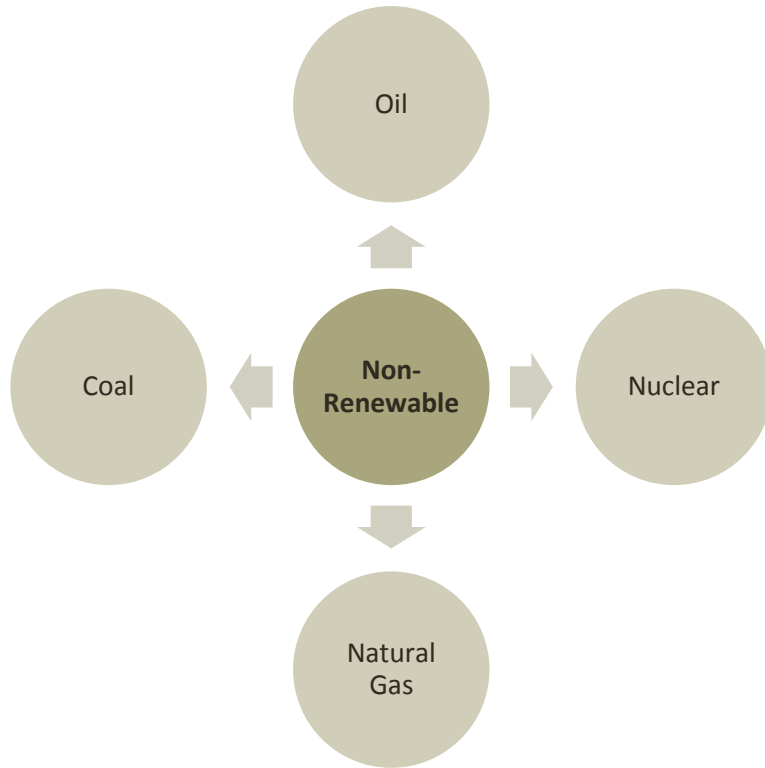
The discipline and measures executed to achieve the minimum possible energy use while meeting the true needs of the activities occurring within a facility. The objectives are resource conservation, climate protection and cost savings, while the users have permanent access to the energy they need.

Topic 2

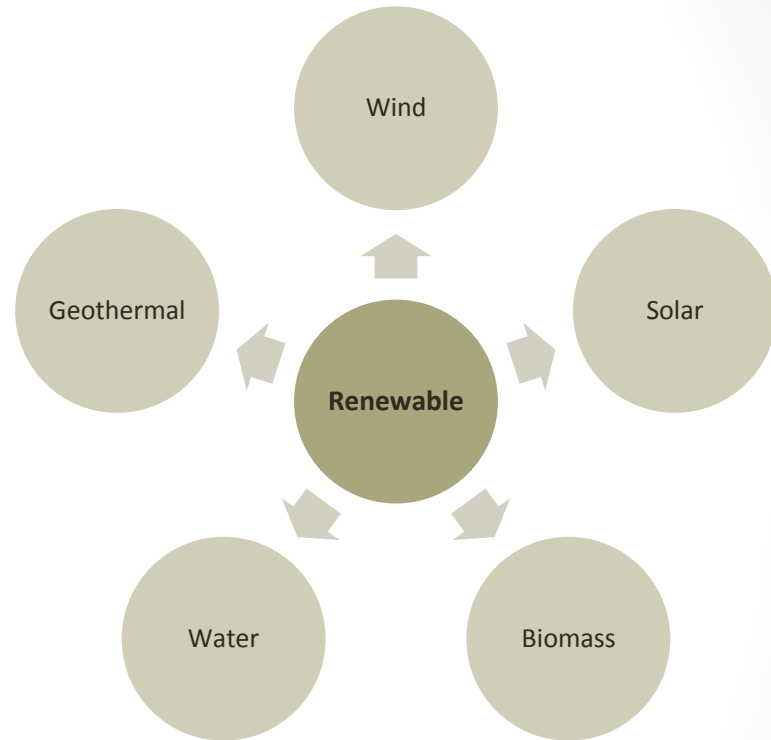
# ENERGY SOURCES



# Renewable & Non-Renewable Sources of Energy



- Fossil fuels and nuclear materials
- Many years to replenish
- Pollution created during gathering and utilisation



- No depletion
- Generate much less pollution both in gathering and production
- Available at no cost

# Pros & Cons for Non-Renewable Energy Sources

		Pros	Cons
Non-Renewable Sources		<ul style="list-style-type: none"> <li>Easier to store and transport than renewable sources.</li> </ul>	<ul style="list-style-type: none"> <li>Global warming.</li> </ul>
	Oil	<ul style="list-style-type: none"> <li>High energy density</li> <li>Availability is widely distributed</li> <li>Infrastructure is already existent</li> <li>Constant power source</li> </ul>	<ul style="list-style-type: none"> <li>Release harmful GHG.</li> <li>Risk of oil spills.</li> <li>Political issues and price spikes.</li> <li>Toxic materials released during refining.</li> <li>Limited in supply.</li> </ul>
	Coal	<ul style="list-style-type: none"> <li>Most abundant in supply.</li> <li>Stable price</li> <li>Produces high energy upon combustion</li> </ul>	<ul style="list-style-type: none"> <li>Mining process is dangerous and causes damage to the environment.</li> <li>Coal sources are fast depleting.</li> <li>Produces carbon dioxide in large quantities.</li> </ul>
	Nuclear	<ul style="list-style-type: none"> <li>Lower cost of generation than fossil fuels.</li> <li>Continuous production of electric energy.</li> </ul>	<ul style="list-style-type: none"> <li>Dangers associated with production process.</li> <li>Risk of nuclear accidents may be disastrous.</li> <li>Management of nuclear waste.</li> <li>Nuclear plants have a limited lifetime and complex dismantling.</li> <li>Risk of warfare.</li> </ul>
	Natural Gas	<ul style="list-style-type: none"> <li>Burns completely, leaves no residue.</li> <li>Can be safely stored</li> <li>Suitable for residential supply.</li> <li>Can be used as fuel for vehicles.</li> <li>Lighter than air so dissipates on leakage.</li> <li>Versatile</li> </ul>	<ul style="list-style-type: none"> <li>Toxic and flammable.</li> <li>Releases GHG when burned.</li> <li>Complex processing for use as a fuel</li> <li>Expensive infrastructure, e.g. pipelines, tanks</li> </ul>

# Pros & Cons for Renewable Energy Sources

Systems for  
Renewable

		Pros	Cons
Renewable Sources		<ul style="list-style-type: none"> <li>Sources are readily available in unlimited abundance.</li> <li>Reduced cost of operation.</li> <li>Much less polluting than non-renewable</li> <li>Sustainable.</li> </ul>	<ul style="list-style-type: none"> <li>Difficult to generate the quantities of electricity as produced by fossil fuel generators.</li> </ul>
	Solar (PV)	<ul style="list-style-type: none"> <li>Unit size is flexible and adaptable to many scenarios.</li> <li>May be installed on roofs.</li> <li>Facilities require less maintenance than traditional generators.</li> </ul>	<ul style="list-style-type: none"> <li>Requires storage to contain the energy between production and consumption.</li> <li>Supply is unreliable.</li> </ul>
	Wind	<ul style="list-style-type: none"> <li>One of the lowest priced renewable energy technologies per kWh</li> <li>High efficiency.</li> </ul>	<ul style="list-style-type: none"> <li>Occupy large tracts of land.</li> <li>Wind speed stability.</li> <li>Good wind sites are often located in remote locations.</li> <li>Noise and aesthetic pollution.</li> <li>Interference with bird migration.</li> </ul>
	Biomass	<ul style="list-style-type: none"> <li>Sustainable harvesting of readily available sources obtained through scrap of other production processes</li> </ul>	<ul style="list-style-type: none"> <li>Cost of transportation of the biomass source.</li> <li>Requires control over harmful gasses released.</li> </ul>
	Water	<ul style="list-style-type: none"> <li>Hydroelectric plants can produce large quantities of electricity.</li> </ul>	<ul style="list-style-type: none"> <li>Require land area for water storage reservoirs.</li> <li>Dams may alter the ecosystem</li> <li>Flow creates downstream erosion and sediment build-up.</li> </ul>
	Geothermal	<ul style="list-style-type: none"> <li>Economical production of electricity</li> </ul>	<ul style="list-style-type: none"> <li>Sources tend to decline</li> <li>Create waste sludge</li> </ul>

# Choosing energy sources

- The choice of which energy source to use depends on:
  - Where the energy is used (at home, in industry, etc.)
  - The economical cost impact.
  - Environmental impact.
  - Production of waste including carbon dioxide.
- The advantages of renewable energy are:
  - Environmentally cleaner.
  - Infinite availability (will not run out)
  - Less cost in transporting fuels.
  - Reduced dependency on fuel suppliers.
  - Energy security.

# Carbon footprints

- The amount of carbon-containing greenhouse gasses (GHG) released into the environment by an activity, process, individual or group of persons.
- All activity data is to be included, e.g. distance travelled, litres of fuel used or tonnes of waste disposed
- Expressed in kg of carbon dioxide
- Usually calculated for the period of a year.
- $$\text{GHG emissions} = \text{activity data} \times \text{emission conversion factor}$$
- Emission conversion factors can be obtained from:  
<http://www.ukconversionfactorscarbonsmart.co.uk/>

# Key data for the World's 10 largest CO<sub>2</sub> Emitters

Country	CCPI Rank		Share of Global GDP	Share of World Population	Share of Global CO <sub>2</sub> Emissions*	Share of Global Primary Energy Supply
	2015	2014				
Germany	22	22	3.44%	1.16%	2.23%	2.34%
Indonesia	23	26	2.35%	3.51%	2.31%	1.60%
India	31	36	6.72%	17.57%	5.70%	5.89%
United States	44	44	17.17%	4.47%	14.69%	16.01%
China	45	46	16.03%	19.30%	23.43%	21.76%
Brazil	49	35	3.05%	2.82%	4.17%	2.11%
Japan	53	52	4.82%	1.81%	3.61%	3.38%
Korea	55	55	1.69%	0.71%	1.75%	1.97%
Russian Federation	56	56	2.63%	2.04%	4.87%	5.66%
Canada	58	58	1.56%	0.50%	1.57%	1.88%
Total			59.45%	53.89%	64.32%	62.59%

\*energy-related emissions and emissions from deforestation

© Germanwatch 2015

**Performance**   ■ Very good   ■ Good   ■ Moderate   ■ Poor   ■ Very poor

**Source:** J. Burck, F. Marten, C. Bals - The Climate Change Performance Index Results 2015, Climate Action Network Europe

<https://germanwatch.org/en/download/10407.pdf>



# époque

## THANK YOU

( 15 )



# Kors: Sistemi Applikati ta' Ġestjoni tal-Energija f' /għall- organizzazzjonijiet (inklużi skejjel)

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## Pre-requisites

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# Module 1

## Building / Organisation Energy

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Topic 2

# ENERGY TRENDS WITHIN THE EU



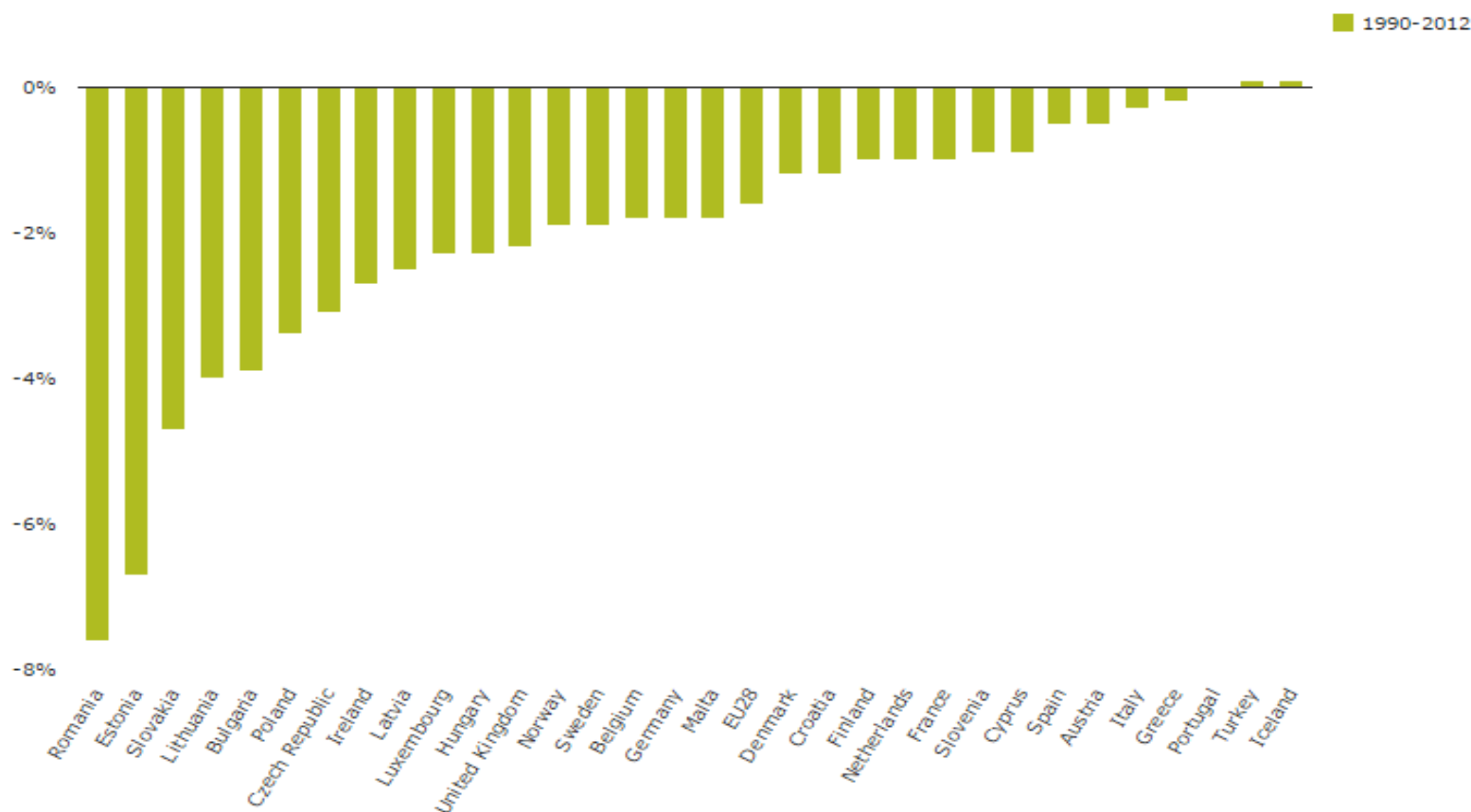
## European Environment Agency indicator for final energy consumption in EU28 (ENER 021)

(Published 21 Jan 2015 )

From **2000 to 2015**, the EU28 final energy intensity has decreased by 16% at an annual average rate of 2%/year.

From **2005 to 2015**, the final energy intensity decreased by 11.9% at an annual rate of 1.8%/year, showing an absolute decoupling, between economic growth and final energy consumption.

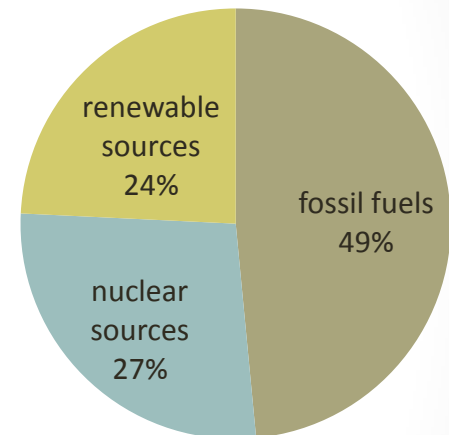
Chart — Compounded annual change rate



# The European Energy System

- The EU28 is still heavily dependent on fossil fuels of which 53% are imported from non-EU countries.
- Energy sources of the total electricity generation in 2012: 48% from fossil fuels; 27% from nuclear sources; 24% from renewable sources.
- The electricity produced from renewable sources increased by 144% between 1990 and 2012 at an average annual rate of 4.1% and at a faster rate of 7.1%/year since 2005.
- In 2012, 46% of the renewable electricity generated was from hydro, 26% from wind, 19% from biomass, 9% from solar and 1% from geothermal.

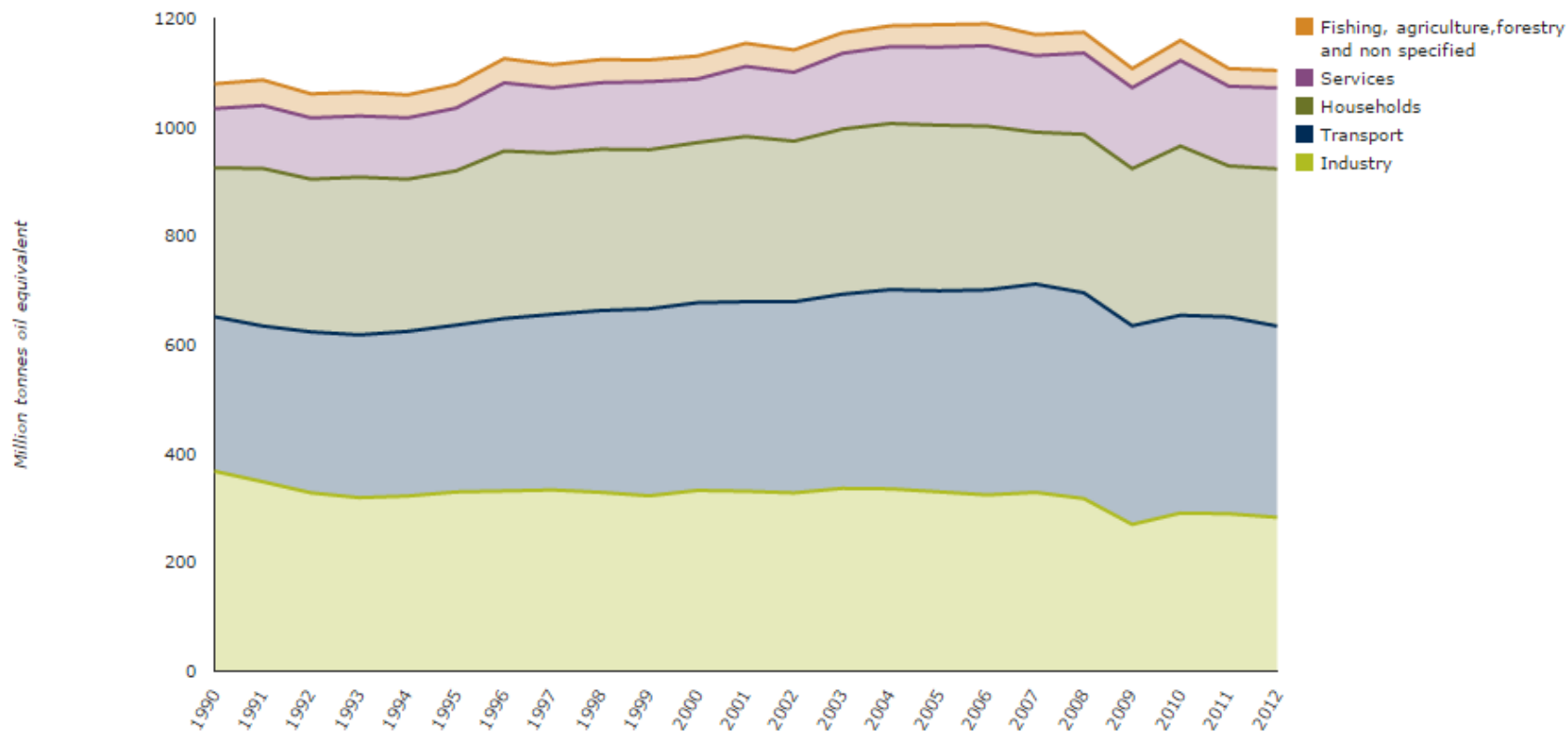
Energy sources (2012)



## Final energy consumption by sector and fuel (CSI 027/ENER 016) - Assessment published Jan 2015

- 1990 to 2012 – EU28 final energy consumption increased by 2.3%
- 2005 to 2012 – EU28 final energy consumption decreased by 7.1%. The services sector is the only sector where the energy consumption increased by 3.5% over this period. Energy consumption dropped by 14% in industry, 5.1% in transport and 4% in households. The implementation of energy efficiency policies and the economic recession played an important part in the reduction of energy consumption.

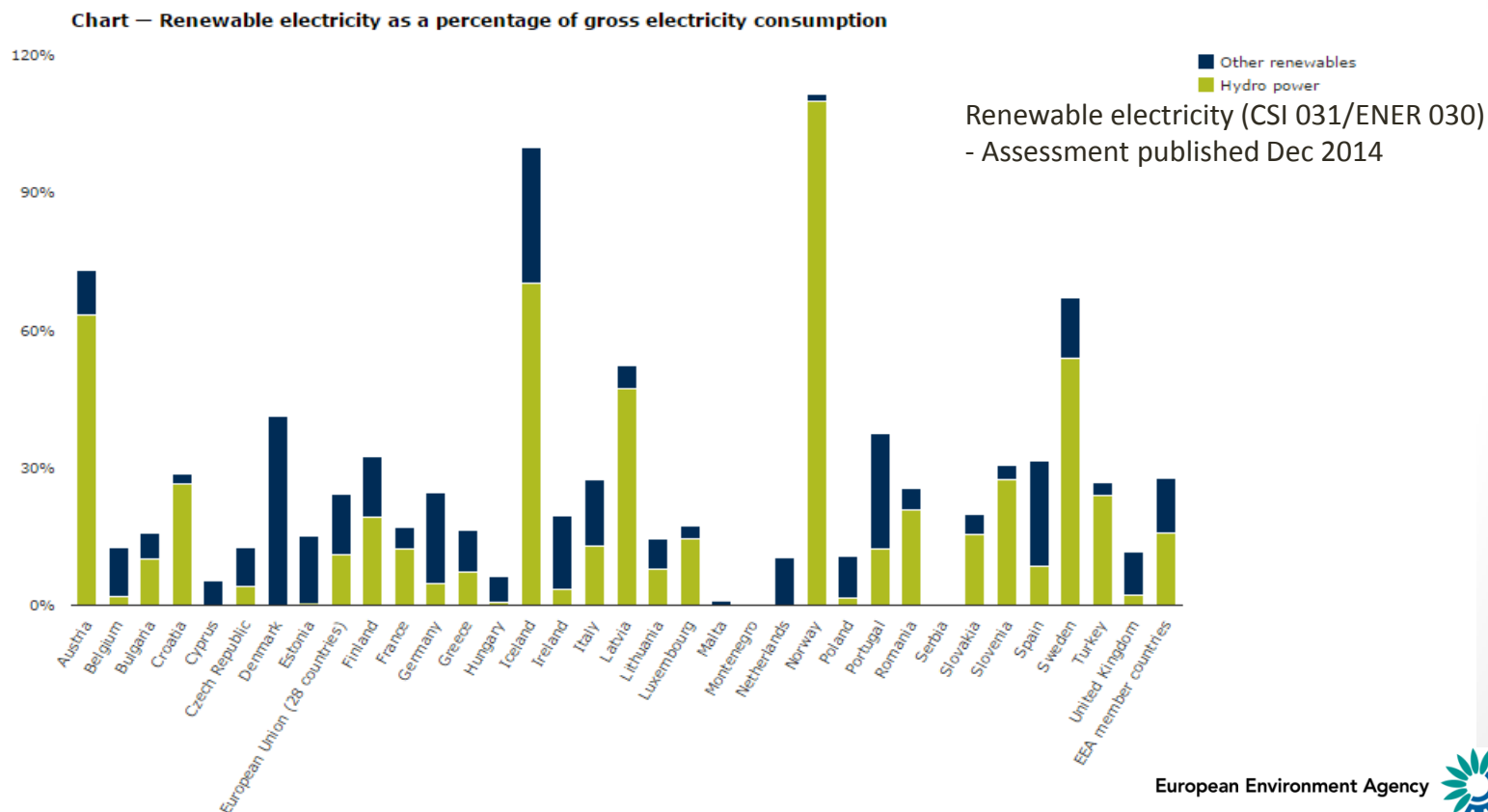
**Chart – Final energy consumption by sector**



# Renewable Energy Use in EU28

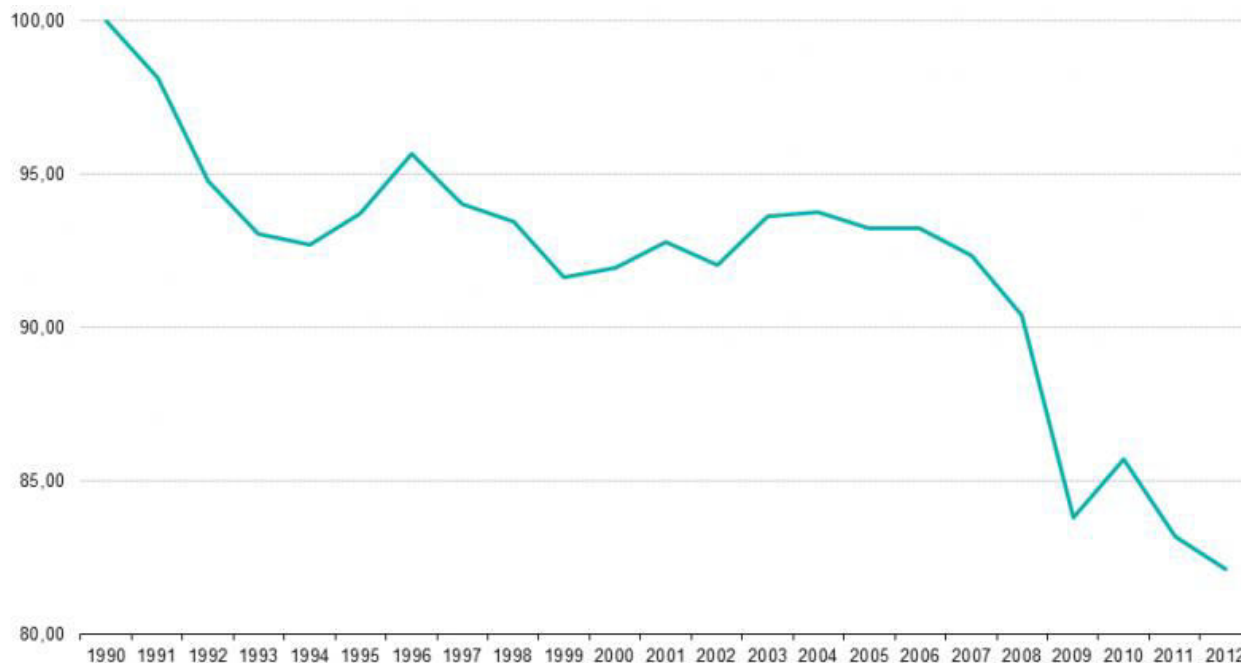
The graph shows the share of renewable electricity expressed as a ratio between electricity produced from renewable energy sources and gross national electricity consumption.

In 2012, the share of renewable electricity in gross electricity consumption in the EU28 was 24.1%. Hydropower accounted for 11% of all electricity generation, followed by wind (6%), biomass and wastes (3%), solar power (2%), and geothermal and other renewables (2%).



# Greenhouse gas emissions

Greenhouse gas emissions trend, EU-28, 1990 – 2012 (Source: eurostat)

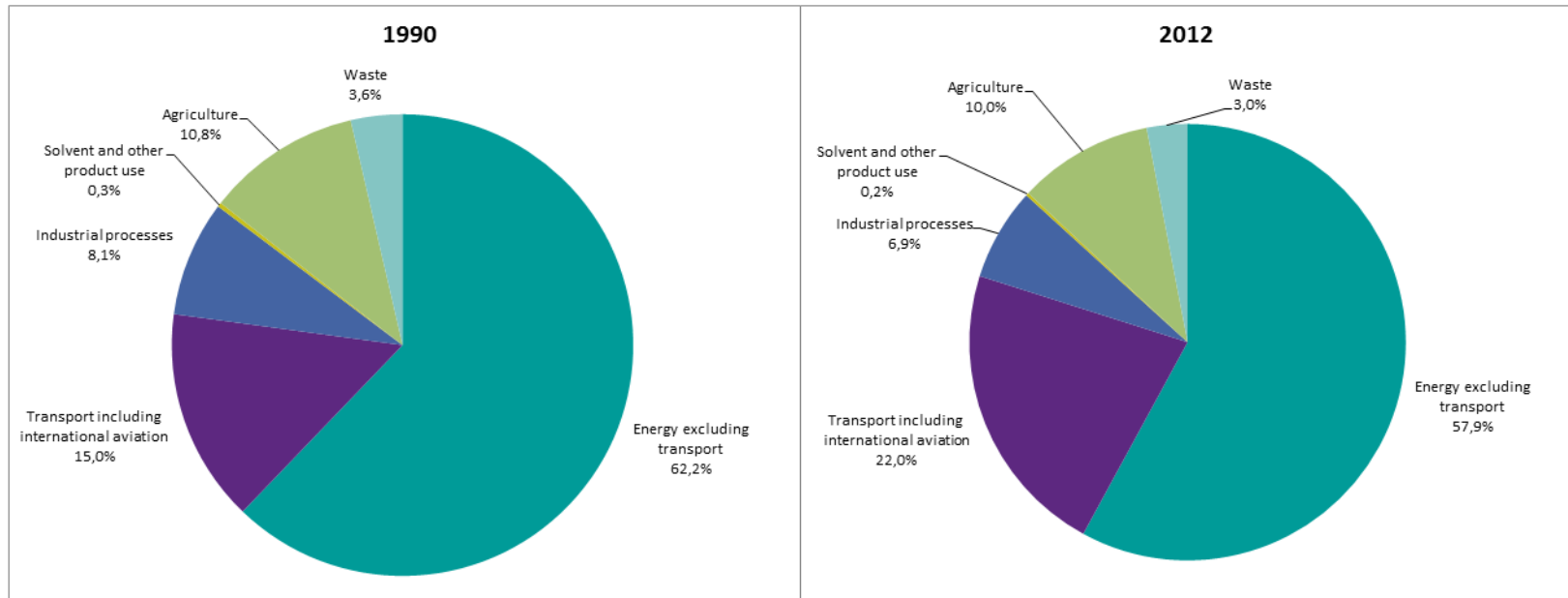


The list of Greenhouse Gasses (GHG) as defined in the Kyoto Protocol are:

- Carbon dioxide (CO<sub>2</sub>)
- Methane (CH<sub>4</sub>)
- Nitrous oxide (N<sub>2</sub>O)
- Hydrofluorocarbons (HFCs)
- Perfluorocarbons (PFCs)
- Sulphur hexafluoride (SF<sub>6</sub>)

# Greenhouse gas emissions sources

Greenhouse gas emissions, analysis by source sector, 1990 and 2012 (Source: eurostat)



The European Environment Agency (EEA) compiles an annual greenhouse gas inventory report on behalf of the EU. Estimates of greenhouse gas emissions are produced for a six main sectors which are delineated in sectors primarily according to the technological source of emissions.

- energy (fuel combustion and fugitive emissions from fuels) – which also includes transport;
- industrial processes;
- solvent and other product use;
- agriculture;
- land use, land use change and forestry (LULUCF)
- waste.



# Module 1: Assignment #1

Compare energy trends amongst the EU28 member states.

Topics to be covered include: energy consumption, dependency on non-renewable fuels, percentage of renewable sources, efficiency measures implemented, etc.

Use actual data to substantiate the analysis.

Expected time employed: 40 hours

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THANK YOU



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## Pre-requisites

- There are no formal prerequisites for this course

# Module 1

## Building / Organisation Energy

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Topic 3

# EU ENERGY PRIORITIES AND ENERGY SAVING STRATEGIES

# An extensive EU legal framework

## Overarching

- Energy end-use efficiency and energy services Directive
- Effort Sharing Decision

## Buildings

- Energy performance of buildings Directive (recast and original) 2002/91/EC and 2010/31/EU
- RES Directive
- Construction products regulation

## Products

- Ecodesign Directive (recast and original)
- Energy Labelling Directive (recast and original)
- Regulation of Energy Star labelling for office equipment

# Europe 2020

**Europe 2020** is a 10-year strategy proposed by the European Commission on 3 March 2010 aiming at "smart, sustainable, inclusive growth" with greater coordination of national and European policy.

The strategy contains five main targets:

- To raise the **employment** rate of the population aged 20–64 from the current 69% to at least 75%.
- To achieve the target of investing 3% of GDP in R&D in particular by improving the conditions for R&D investment by the private sector, and develop a new indicator to track **innovation**.
- To reduce greenhouse gas emissions by at least 20% compared to 1990 levels or by 30% if the conditions are right, increase the share of renewable energy in final energy consumption to 20%, and achieve a 20% increase in **energy efficiency**.
- To reduce the share of early **school** leavers to 10% from the current 15% and increase the share of the population aged 30–34 having completed tertiary from 31% to at least 40%.
- To reduce the number of Europeans living below national poverty lines by 25%, lifting 20 million people out of **poverty**

[http://ec.europa.eu/europe2020/index\\_en.htm](http://ec.europa.eu/europe2020/index_en.htm)

[http://ec.europa.eu/clima/policies/package/index\\_en.htm](http://ec.europa.eu/clima/policies/package/index_en.htm)

# 2020: Energy Efficiency policies in more detail

The EU has adopted a number of measures/policies to improve energy efficiency in Europe. They include:

- an annual reduction of 1.5% in national **energy sales**
- EU countries making energy efficient **renovations** to at least 3% of buildings owned and occupied by central governments per year
- mandatory energy efficiency **certificates** accompanying the sale and rental of buildings
- minimum energy efficiency standards and **labelling** for a variety of products such as boilers, household appliances, lighting and televisions (EcoDesign)
- the preparation of **National Energy Efficiency Action Plans** every three years by EU countries
- the planned rollout of close to 200 million **smart meters** for electricity and 45 million for gas by 2020
- large companies conducting **energy audits** at least every four years
- protecting the rights of consumers to receive easy and free access to **data** on real-time and historical energy consumption.

# 2020: Energy Efficiency policies in more detail

## Other EU-wide measures/policies include:

- Developing and implementing the **EU Emissions Trading System**, with the ultimate aim of building an international carbon trading market, including aviation;
- Monitoring the implementation of Member States' emission reduction targets in the **sectors outside the EU ETS** ("Effort Sharing Decision");
- Implementing the legislation to raise the share of energy consumption produced by **renewable energy sources**, such as wind, solar and biomass, to 20 % by 2020;
- A target to increase Europe's energy efficiency by 20 % by 2020 by improving the energy efficiency of **buildings** and of a wide array of **equipment** and **household appliances**;
- Binding targets to reduce CO2 emissions from **new cars and vans**;
- Supporting the development of **carbon capture and storage (CCS) technologies** to trap and store CO2 emitted by power stations and other major industrial installations.

# Support measures and networks

## EPBD implementation support

- Concerted action EPBD
- EPB Committees

- CEN EPBD standards



## Financial & fiscal instruments

- Cohesion policy funds
- ELENA
- EEE-F

- Possibilities for
- State Aid
  - VAT reduced rates

- IEE programme
- Research FP
- EU CONCERTO initiative

## Networks

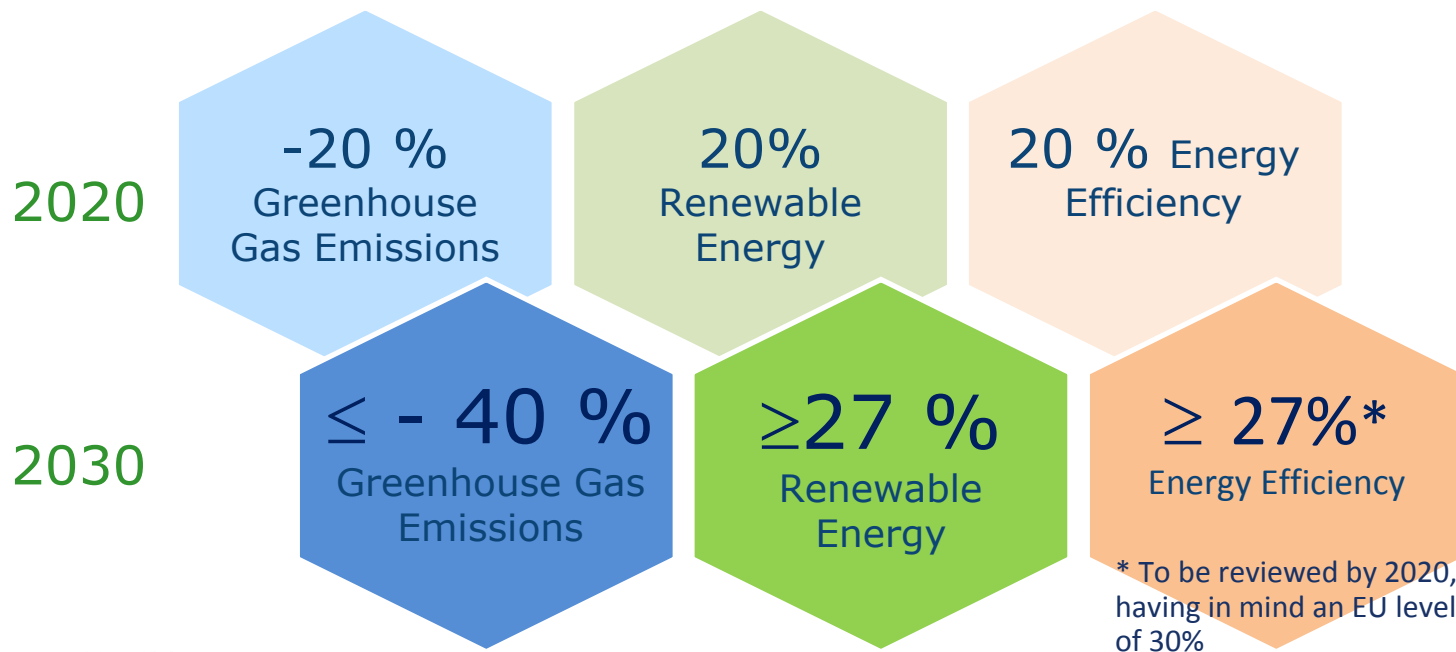


- Sustainable Energy Europe Campaign

- ManagEnergy network



# 2030 framework for climate and energy



# The 2030 Framework for Climate & Energy: Agreed Headline Targets

- A binding EU target of **at least 40%** domestic reduction in **GHG emissions** compared to 1990, delivered collectively with reductions in
  - ETS sectors: 43% by 2030 compared to 2005
  - non-ETS sectors: 30% by 2030 compared to 2005.
- An EU-wide **binding** target of **at least 27%** for the share of **renewable energy** consumed in the EU by 2030.
- A non-binding EU target of **27% energy efficiency** improvements against future energy consumption projections; will be **reviewed by 2020**, having in mind an EU level of 30%.

# Energy efficiency - Policy at EU level

- March 2010: Europe 2020: A strategy for smart, sustainable and inclusive growth – COM(2010) 2020
- Confirmation of three 20% targets for 2020
- March 2011: A Roadmap for moving to a competitive, low carbon economy in 2050 – COM(2011) 885
- Reduce GHG emissions by 80-95% by 2050 compared to 1990
- A fully decarbonised Power Sector
- January 2014: A policy framework for climate and energy in the period from 2020 to 2030 – COM(2014) 15
- Reduce GHG emissions by 40% below the 1990 level by 2030

# European Energy Union with forward-looking climate change policy

- Secure, sustainable, competitive, affordable energy in **5 dimensions**:
  - security of supply
  - deeper integration of EU national energy markets
  - reducing EU energy demand
  - decarbonisation and
  - research and development
- € 315bn **Investment Package**

# Module 1: Assignment #2

The EU Energy Challenge is designed to support the transition to a reliable, sustainable and competitive energy system. The Energy Challenge is structured around seven specific objectives and research areas:

- Reducing energy consumption and carbon footprint
- Low-cost, low-carbon electricity supply
- Alternative fuels and mobile energy sources
- A single, smart European electricity grid
- New knowledge and technologies
- Robust decision making and public engagement
- Market uptake of energy and ICT innovation.

Analyse and discuss the status of each member state as per EU 2020 energy efficiency priority area for Climate Change and Energy Sustainability

- **greenhouse gas emissions 20% lower than 1990**
- **20% of energy from renewables**
- **20% increase in energy efficiency**

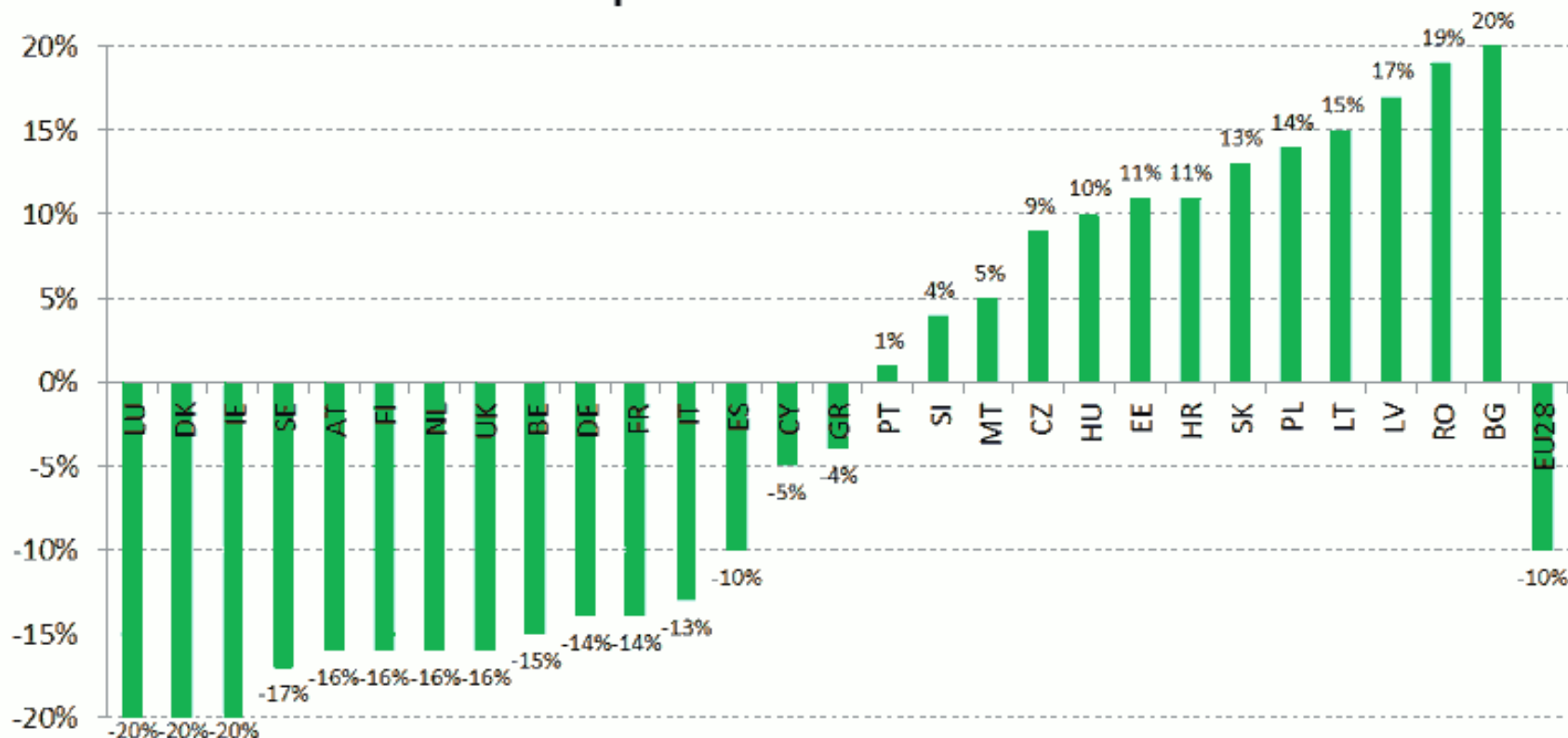
Use actual data to substantiate the analysis.

Expected time employed: 40 hours

# Effort Sharing Decision

The Effort Sharing Decision sets national emission targets for 2020, expressed as percentage changes from 2005 levels. They have been set on the basis of Member States' relative wealth (measured in GDP/capita), and range from a 20% emissions reduction by 2020 (from 2005 levels) for the richest Member States to a 20% increase for the least wealthy one, Bulgaria. Croatia, which joined the EU on 1 July 2013, is allowed to increase emissions by 11%.

## Member State greenhouse gas emission limits in 2020 compared to 2005 levels



Source: European Commission – Climate Action – Effort Sharing Decision

# Module 1: Final Assignment

Identification and discussion of best practices in the EU Member States to contribute to the achievement of the objectives set by the EU 2020 within the energy efficiency priority area.

Following the analysis carried out in Assignment #2, highlight any best practices encountered for each of the energy efficiency targets, giving further detail of their performance and reasons for success. Analyse the scenario in which they are implemented and advocate whether these best practices could also be applied to other member states.

Expected time employed: 10 hours



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## THANK YOU



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- Energy managers and energy coordinators (engineers, plant managers, etc.)

## Pre-requisites

- There are no formal prerequisites for this course

# Module 2

## Energy Standards & Directives

époque

( 4 )

# Definitions

## ENERGY DIRECTIVE

- Directives are legal acts.
- They require member states to achieve a particular result without dictating the means of achieving that result.
- The exact rules to be adopted are not specified by the directives.
- Member states are allowed a certain amount of leeway as to the exact rules to be adopted by means of a variety of legislative procedures.

## ENERGY STANDARD

- Standards are documents providing:
  - Requirements
  - Specifications
  - Guidelines
  - Characteristicsthat can be used consistently to ensure that materials, products, processes and/or services are fit for their purpose.
- Adhering to and implementing a standard is non-obligatory

Topic 5

# ENERGY DIRECTIVES



# 2012 Energy Efficiency Directive

**Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC Text with EEA relevance**

Directive 2012/27/EU establishes a common framework of measures for the promotion of energy efficiency within the EU in order to ensure the achievement of the 2020 20% target on energy efficiency and to pave the way for further energy efficiency improvements beyond that date.



The directive applies the minimum rules. However, member states may choose to go further in their requirements for energy efficiency.

Key measures cover:

- reduction of energy sales
- renovation of public buildings
- roadmaps for the entire building sector
- energy audits, management plans and deployment of combined heat and power generation (CHP) and public procurement

# Module 2: Assignment #1

Write a report on the status of implementation for the key measures of the 2012 Energy Efficiency Directive across four Member States of your choice.

Highlight and detail at least one member state that has gone beyond the energy efficiency requirements stated by the directive.

Expected time employed: 30 hours

# 2010 Energy Performance of Buildings Directive

Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings

- Buildings are responsible for 40% of energy consumption and 36% of CO2 emissions in the EU.
- The Energy Performance of Buildings Directive specifies:
  - energy performance certificates are to be included in all **advertisements** for the sale or rental of buildings
  - EU countries must establish **inspection schemes** for heating and air conditioning systems or put in place measures with equivalent effect
  - all **new buildings** must be nearly zero energy buildings by 31 December 2020 (public buildings by 31 December 2018)
  - EU countries must set **minimum energy performance requirements** for new buildings, for the major renovation of buildings and for the replacement or retrofit of building elements (heating and cooling systems, roofs, walls, etc.)
  - EU countries have to draw up lists of **national financial measures** to improve the energy efficiency of buildings



# EU Energy Labelling Directive

**Directive 2010/30/EU of the European Parliament and of the Council of 19 May 2010 on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products.**

- Energy labelling help consumers choose energy efficient products.
- Labelling requirements are detailed for individual product groups.
- The directive covers all energy-related products, except vehicles, that are placed on the EU market.



# Ecodesign Directive

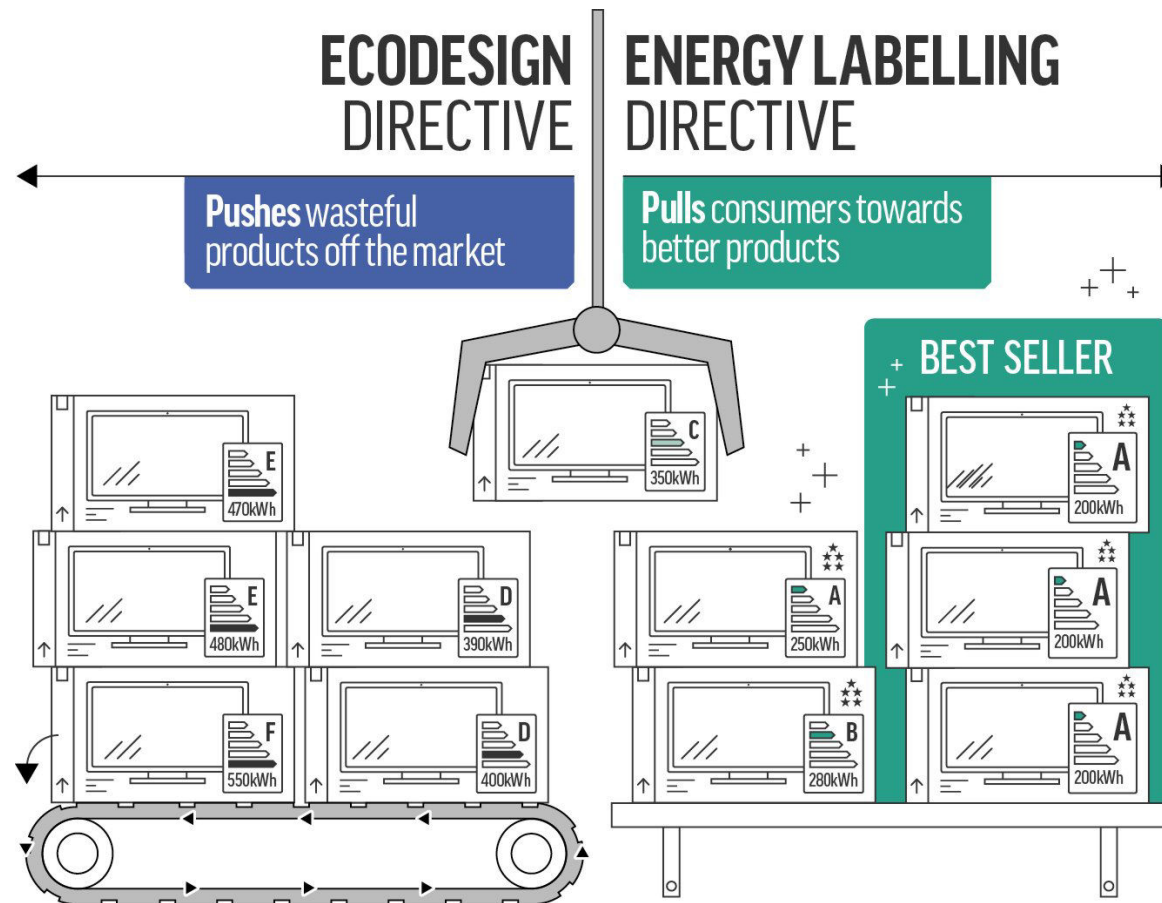
**Directive 2009/125/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products (recast)**

- Ecodesign directive establishes minimum energy efficiency standards for manufacturers to decrease the energy consumption of their products.
- Standards are set at a European not National level.
- The directive includes energy-using as well as energy-related products.
- The philosophy is to design products to comply with the principles of economic, social and ecological sustainability.
- It is estimated that over 80% of all product-related environmental impacts are determined during the design phase of a product so eco-design aims to consider these aspects at an early stage.



# Ecodesign & Energy Labelling

The Ecodesign and Energy Labelling Directives are complementary, as they respectively push the market and pull it towards more efficient products.



Source: [www.coolproducts.eu/ecodesign-for-dummies](http://www.coolproducts.eu/ecodesign-for-dummies)

# Renewable Energy Directive

**Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC**

- The Directive establishes as overall policy for the production and promotion of energy from renewable sources in the EU.
- Through individual national targets and national action plans the aim is to fulfil at least 20% of total energy needs with renewables by 2020.
- All EU countries must also ensure that at least 10% of transport fuels come from renewable sources by 2020.
- Progress towards meeting the national targets is measured every two years when the EU countries publish their national progress reports.





# Module 2: Assignment #2

Write a report on the status of implementation for the Renewable Energy Directive across three Member States of your choice.

Identify any best practices leading to the widespread devolution of the directive.

Expected time employed: 30 hours

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## THANK YOU

( 15 )



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Topic 6

# ENERGY STANDARDS



- **ISO 9001:2008 Quality Management Systems** consists of generic requirements that are intended to be applicable to a quality management system for any organisation which:
  - needs to demonstrate its ability to consistently provide product that meets customer and applicable statutory and regulatory requirements, and
  - aims to enhance customer satisfaction through the effective application of the system, including processes for continual improvement of the system and the assurance of conformity to customer and applicable statutory and regulatory requirements.



- **EMAS : Eco-Management and Audit Scheme\*** is an environmental management tool that assists an organisation aiming to:
  - improve its environmental and financial performance, and
  - communicate its environmental achievements to stakeholders and society in general.

\*The revised Regulation (EC) No 1221/2009 of the European Parliament and of the Council of 25 November 2009 on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS III) entered into force on 11 January 2010.

**ISO 14001:2004 – Environmental Management System** is applicable to any organisation that wants to:



- establish, implement, maintain and improve an environmental management system,
- assure itself of conformity with its stated environmental policy, and to
- seek environmental conformance with other external organisations.

**ISO 50001:2011 – Energy Management System** provides a framework for organisations to:



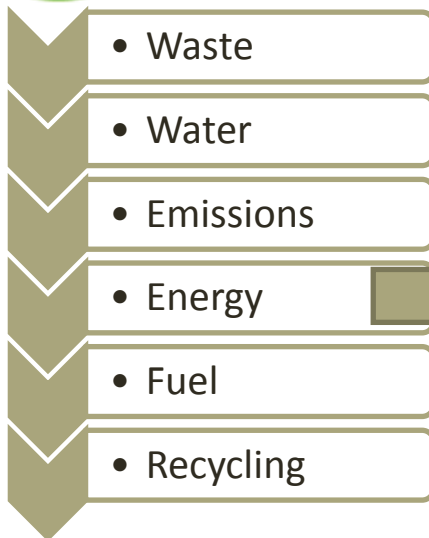
- develop a policy for more efficient use of energy
- fix targets and objectives to meet the policy
- use data to understand & make decisions about energy use
- measure the results
- review how well the policy works, and
- continually improve energy management.

# ISO 50001:2011 in relation to ISO 14001:2004



**ISO 14001:2004**

**Environmental Management System**



**ISO 50001:2011**

**Energy Management System**

# Module 2: Final Assignment

Write a report discussing the different directives and standards presented in Module 2.

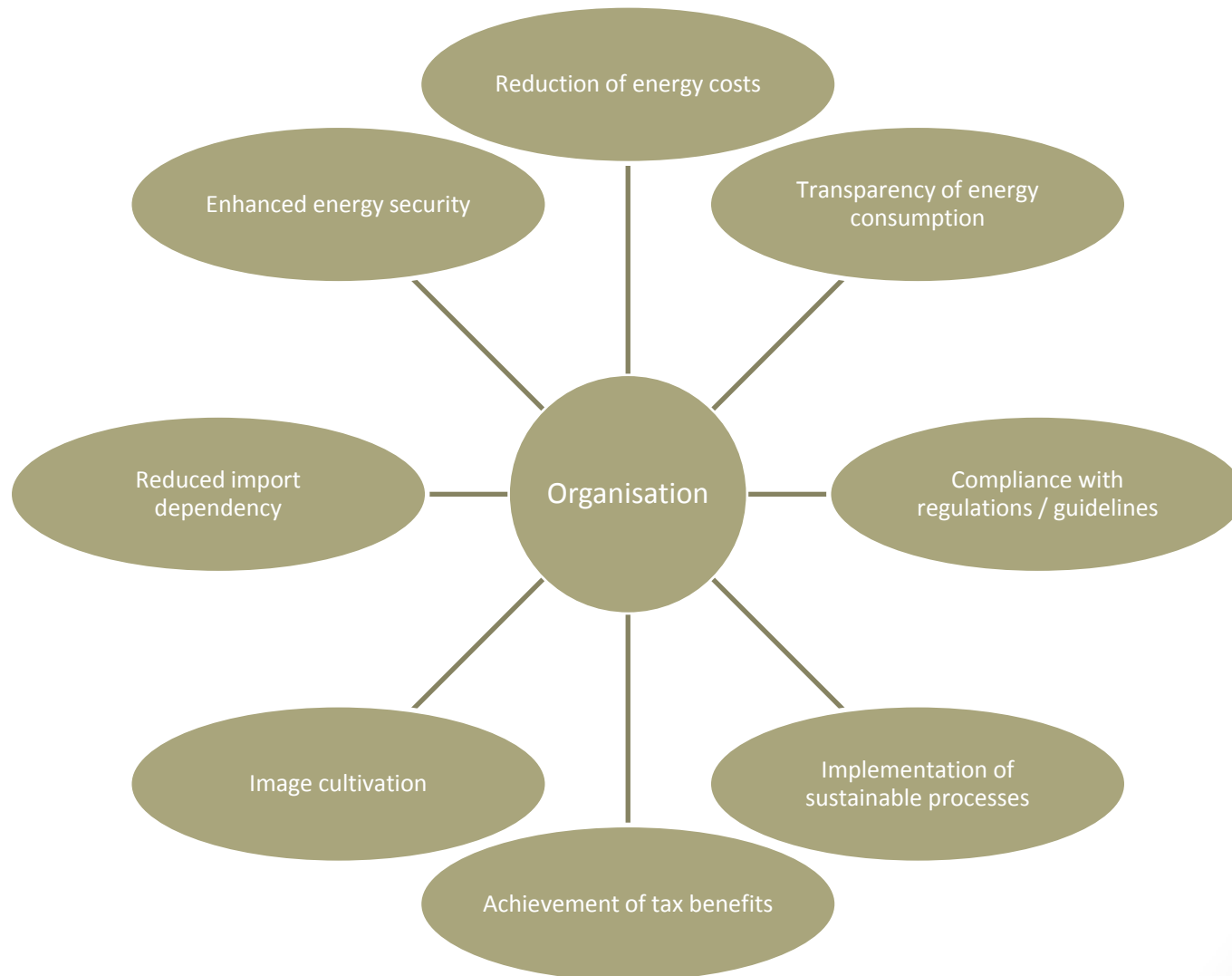
The report should cover each of their applicability, pros and cons, complementarities and differences.

Expected time employed: 30 hours

Topic 7

# BENEFITS FROM ENERGY MANAGEMENT SYSTEMS IMPLEMENTATION

# Benefits of implementing an EnMS





# Drivers for implementing an EnMS

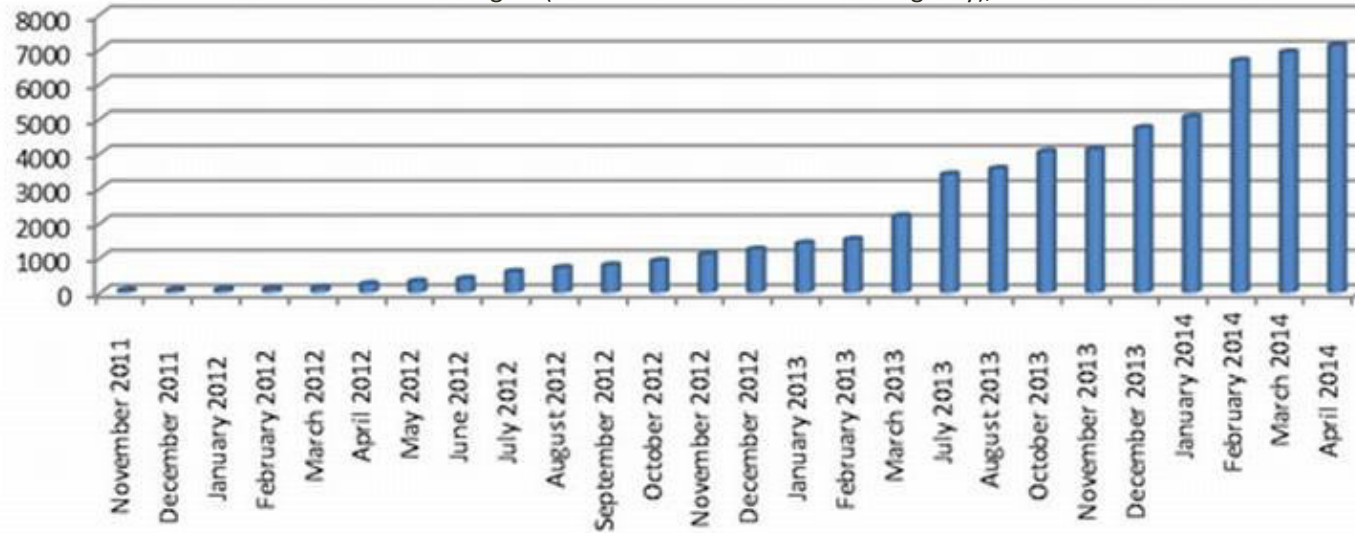
- Legislation (may vary by country)
- Fiscal incentives
- Reduced costs
- Customer supply chain
- Shareholders
- Public perception

# ISO 50001 Uptake

demands for  
ISO 50001

## Number of ISO 50001 certified sites worldwide

Source: R. Peglau (German Federal Environment Agency), 2014



ISO 50001  
Certificates in  
2013 = 4,826

ISO 50001  
Certificates in  
2012 = 2,236

Increase of  
+116%

Source: ISO

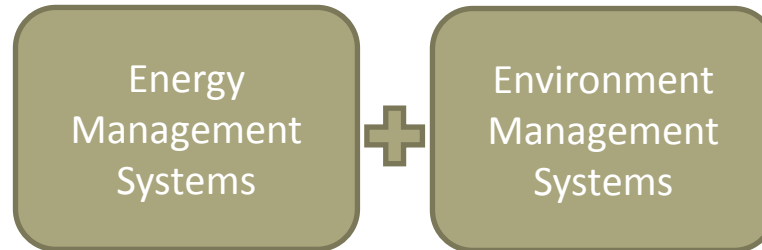
## 7,100 certified sites worldwide as of April 23, 2014

The number of global ISO 50001 certified sites has increased by 214% over the past year (March 2013 to March 2014).

Up to the end of December 2013, at least 4,826 ISO 50001:2011 certificates, a growth of 116% (+2,590), had been issued in 78 countries and economies, 18 more than in the previous year.

The top three countries for the total number of certificates and growth in number of certificates in 2013 were Germany, the UK, and Italy.

# Integration of ISO 50001 & ISO 14001



- Why integrate ISO 50001 and ISO 14001?
  - Internal budget restrictions
  - Return-on-investment (ROI)
  - Commitment to the environment
  - Designed to be integrated
  - International recognition
  - Scope of interest

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## THANK YOU

# Modulu 3

## Sistemi ta' Ġestjoni tal-Energija

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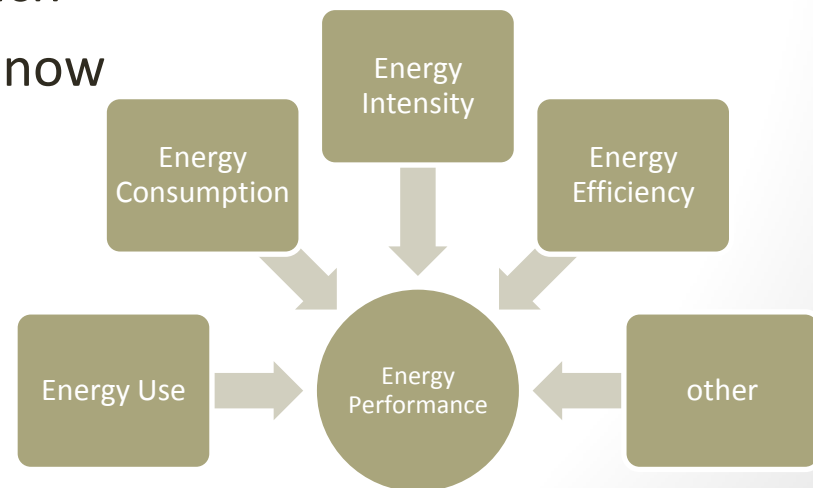
# Module 3 - Overview & Goals

- This course is based on the the ISO 50001:2011 framework and aims to empower the learner with the necessary skills to be able to:
  - design and implement an EnMS for an organisation/building
  - argue in favour of energy conservation through energy management
  - collect and interpret data of energy consumption to assess the performance characteristics of a building/organisation
  - identify and quantify opportunities to save energy
  - target those opportunities and track any energy savings
  - develop policies and structures to structure an effective EnMS.



# ISO 50001 – Terms Used

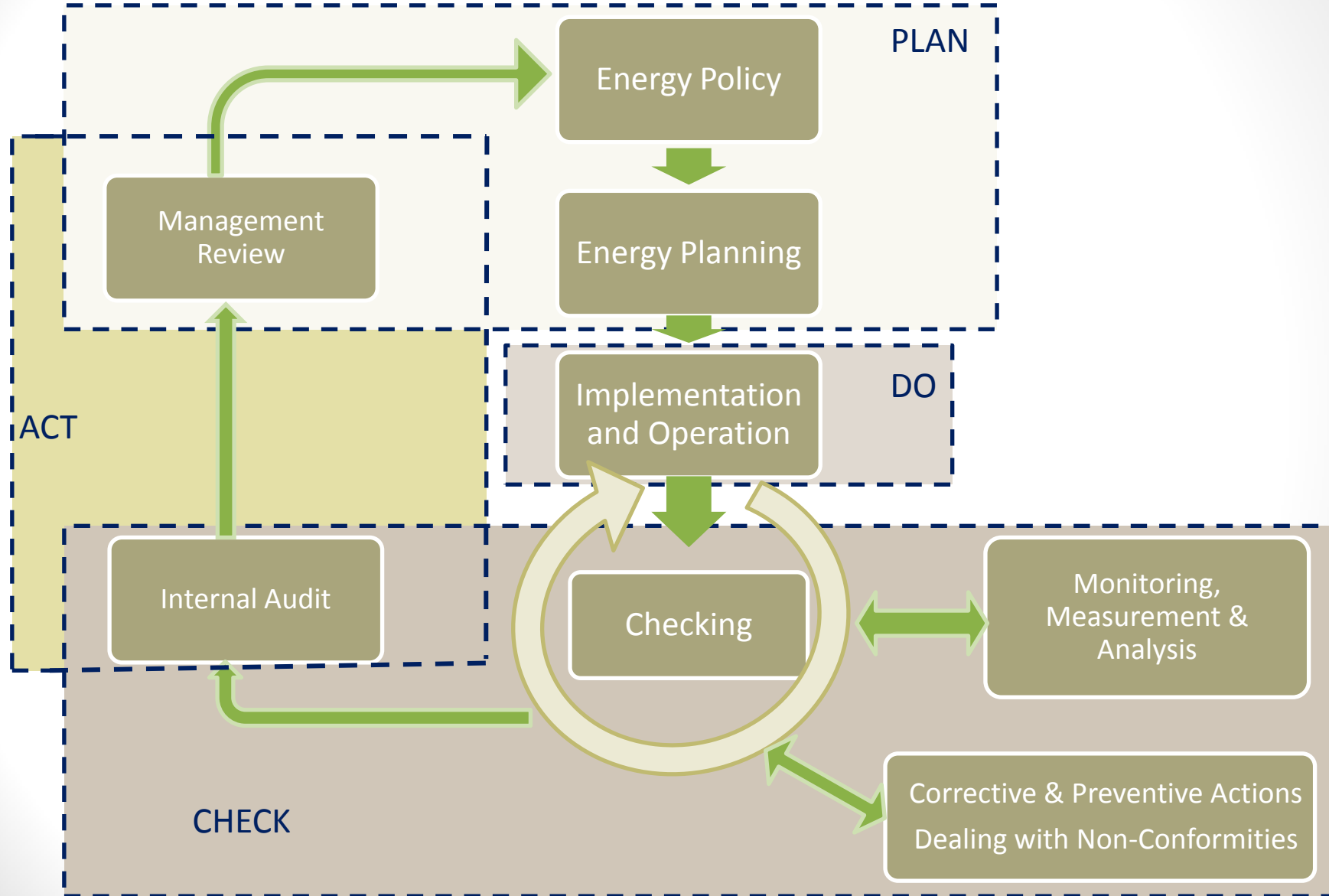
- Energy – all types of energy consumed within the organisation / building
- Energy use – the how of energy use
- Energy consumption – total quantity being used
- Energy baseline – the starting point
- Energy performance indicator (EnPI) – indicator of progress
- Energy performance – how much
- Energy review – where we are now



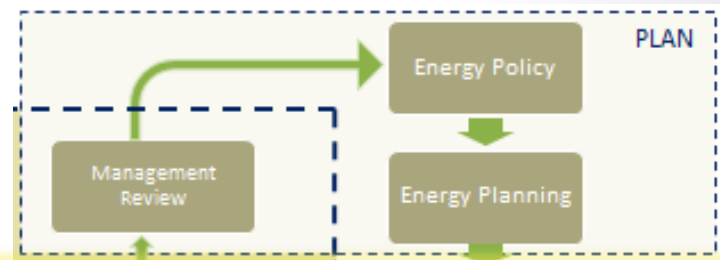
Topic 8

# PLAN-DO-CHECK-ACT PROCESS

# Overview of an EnMS – PDCA Process



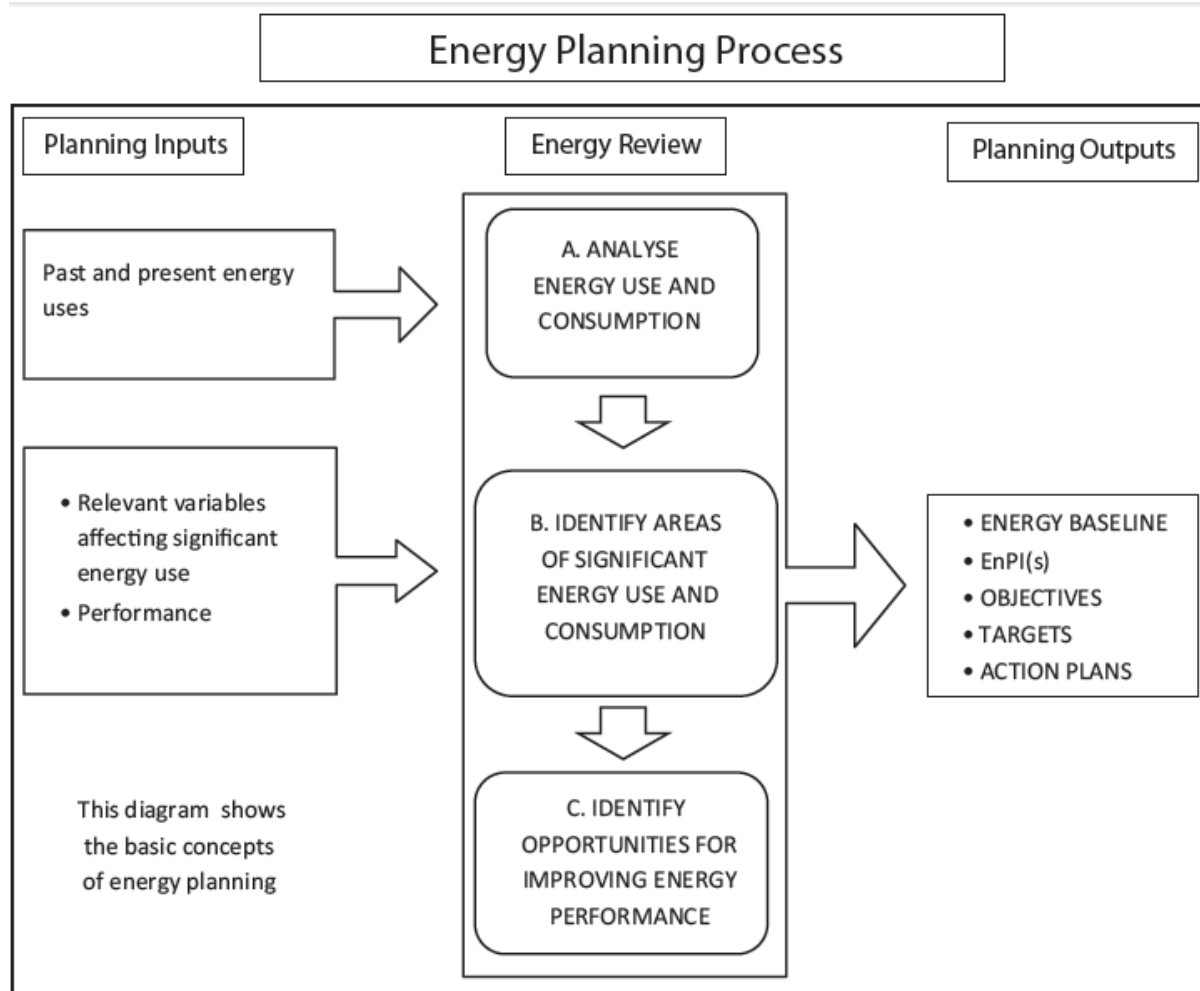
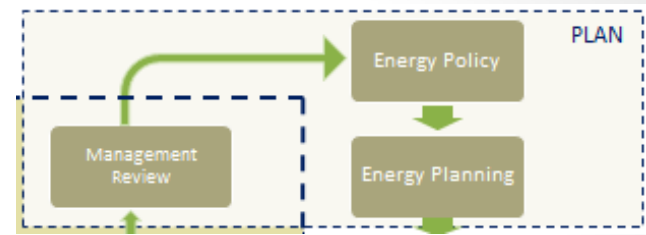
# PLAN



Conduct an energy review and establish the baseline, benchmark against similar sites, set objectives and targets, develop resources and action plans necessary to deliver results in accordance with the organisation's energy policy.

- Top management must be actively involved.
- Energy team led by an energy officer must be appointed.
- Team is to decide on the energy policy that must take the form of a written statement.
- The policy must be communicated to all the organisation.
- The planning stage will identify the significant energy users and prioritise the opportunities for energy performance improvement.

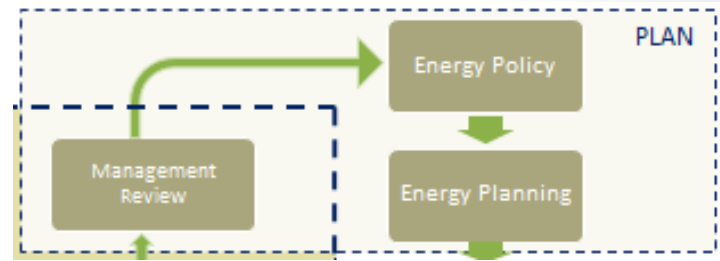
# PLAN - general



Source: IS/ISO 50001:2011

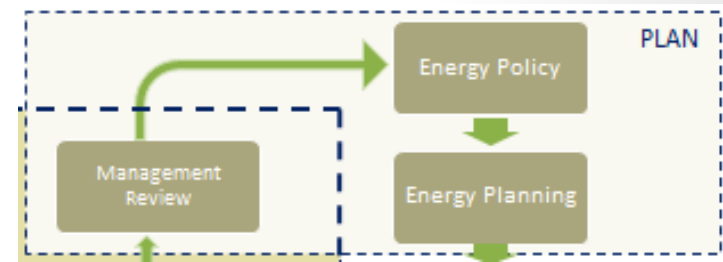
Energy planning process concept diagram

# PLAN – energy policy



- The energy policy must be tailor-made to the nature and scale of the organisation's energy use and consumption patterns
- Continually improve the energy performance of the organisation.
- Legal and other requirements to be met.
- Suitable framework of energy management.
- Provide framework for purchasing and design of energy efficient products & services.

# PLAN – management review

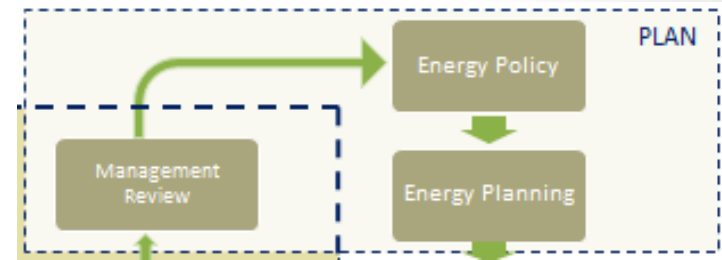


The methodology and criteria used to develop the energy review are to be documented. The review is to include:

- Energy sources: past and present energy uses, energy consumption and energy sources
- Identify areas of significant energy use: facilities, equipment, systems, processes and personnel.
- Identify areas for possible improvements
- Prioritise those areas.
- Repeat the review at defined intervals.

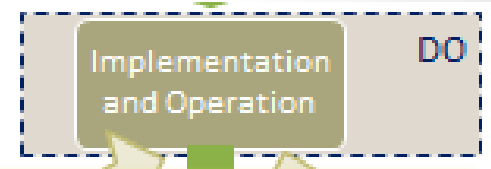


# PLAN – energy planning



- Step 1: Define the energy baseline
  - Based on management review
  - Adjust the energy baseline when needed
- Step 2: Define the EPIs
  - Allow for measuring and monitoring
  - Easy to interpret
  - Regularly reviewed in relation to the baseline
- Step 3: Define objectives and targets
  - Consistent with the energy policy
  - Inline with energy performance opportunities
  - Action plan with timeframes
  - Consistent with legal and business requirements

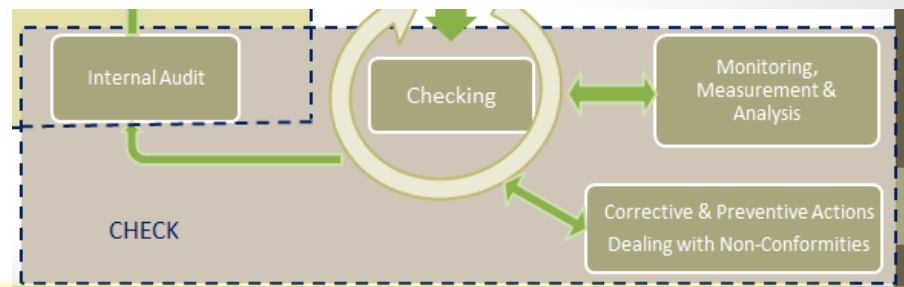
# Do - Implementation and operation phase



Implement the energy management action plans.

- Resources must be made available
- Roles, responsibilities and authorities established
- All persons made aware of EnMS plans
- All persons must be capable of carrying out their roles
- Training and awareness for all involved
- Knowledge transfer framework
- Documentation and document control
- Operational control
  - Developing criteria for effective operation and maintenance
  - Operating and maintaining in accordance with criteria
  - Communicating operational controls to personnel
- Plans for emergency situations
- New designs to use EnMS as their basis
- Procurement of energy services, products, equipment and energy supply
  - Inform suppliers / establish criteria / define and document

# CHECK

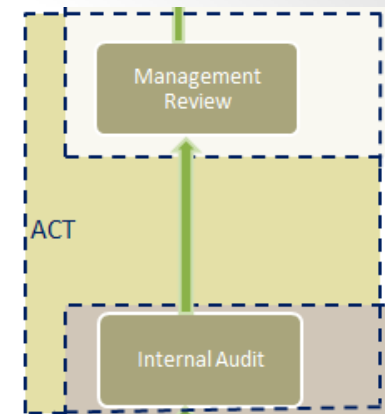


Monitor and measure processes, review the level of target achievement and the effectiveness of the EnMS against the objective of the energy policy.

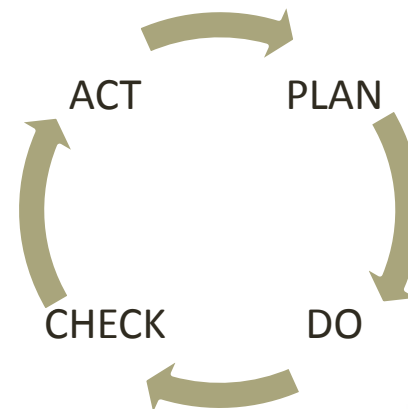
- Monitoring and measurement
  - Operating procedures
  - Calibration of measuring equipment
- Analysis: Evaluation of compliance
  - Investigate any significant deviations to the energy performance
- Dealing with non-conformities: corrective and preventive actions
- Internal audits to verify EnMS functionality and performance
- All checking activities and outputs are to be recorded and documented
- The control of documents and records is also to be performed at this stage.

# ACT

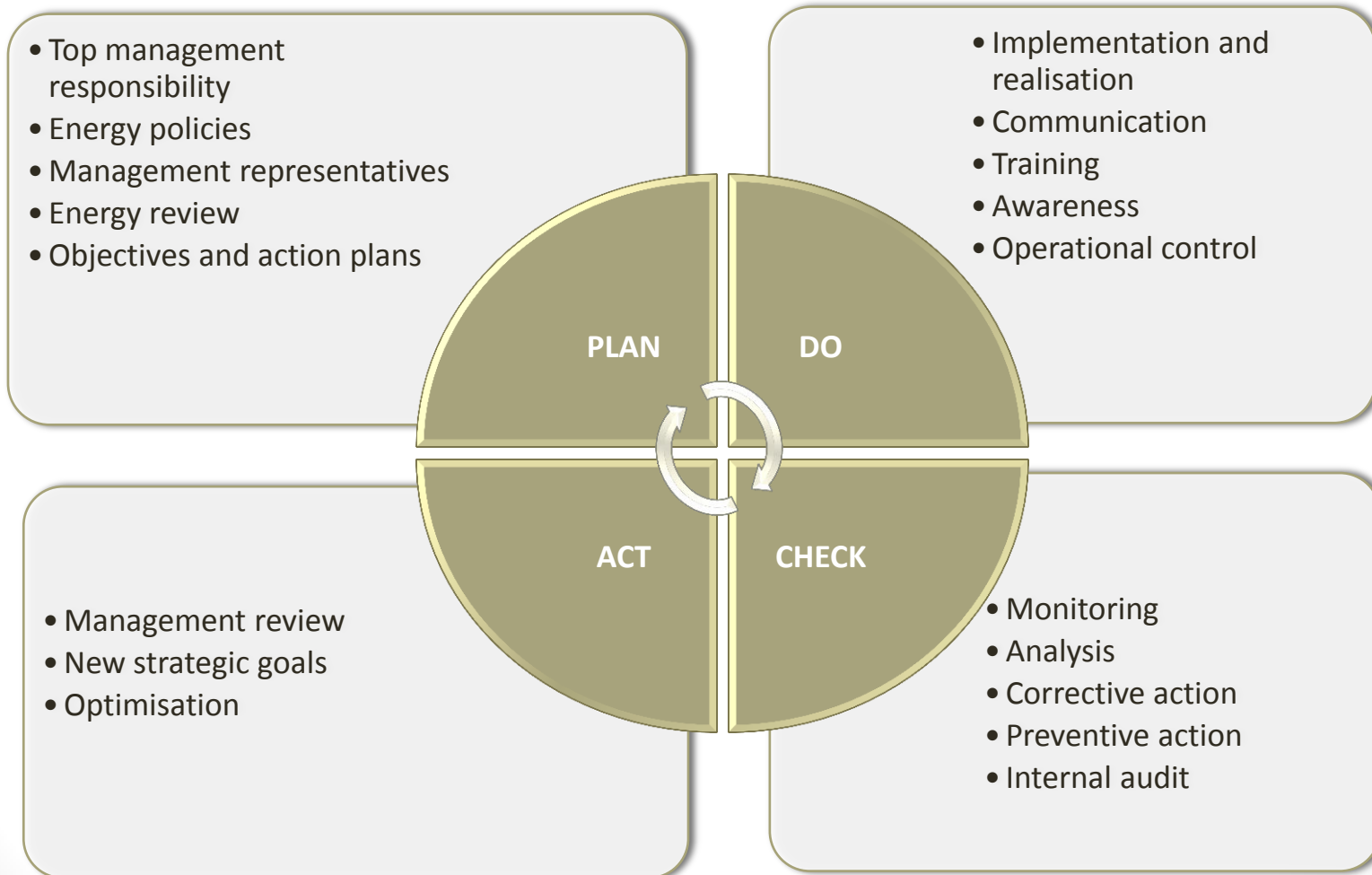
Recognise achievements, take action to continually improve energy performance and the EnMS, derive new objectives.



- Valuation report from top management
- Corrective or preventive actions initiated
- Processes optimised
- New targets/goals derived
- PDCA process starts again



# Summary of the PDCA process



# Module 3: Assignment #1

Describe the PDCA process for implementation of an EnMS in a generic scenario.

Expected time employed: 15 hours

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## THANK YOU

( 17 )



# Modulu 3

## Sistemi ta' Ġestjoni tal-Energija

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# Course Content

- Module 1 – Building / Organisation Energy
  - Topic 1: Definitions of common energy terminology
  - Topic 2: Energy sources
  - Topic 3: Energy trends within the EU
  - Topic 4: EU energy priorities and energy saving strategies
- Module 2 – Energy Standards & Directives
  - Topic 5: Energy directives
  - Topic 6: Energy standards
  - Topic 7: Benefits from EnMS implementation
- Module 3 – Energy Management Systems
  - Topic 8: Plan-Do-Check-Act process
  - Topic 9: Energy monitoring techniques
  - Topic 10: Energy planning for reducing consumption
  - Topic 11: Energy management documentation skills
  - Topic 12: Energy Efficiency Knowledge Transfer Framework
  - Topic 13: Implementing an EnMS within an organisation
- Module 4 – Case Study

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Il-lingwa tat-tagħlim fl-Università ta' Malta hija l-Ingliż u għalhekk il-kontenut tal-kors qed jiġi pprezentat bil-lingwa Ingliża għal-użu tal-istudenti Maltin.

Topic 9

# ENERGY MONITORING TECHNIQUES

# You cannot manage what you cannot measure!

- Monitoring techniques provide **feedback** to the energy managers on:
  - operating practices,
  - results of EMS actions,
  - peak energy usage periods and their causes, and
  - more importantly give early warnings of unexpected excess consumptions caused by equipment malfunctions, operator errors, unwanted behaviours, lack of maintenance, etc.
- Each organisation should ensure that all **key characteristics** of its operation are monitored, measured and analysed at planned intervals. The key areas to cover include minimally:
  - Significant energy users and other outputs of the energy review
  - Relevant variables related to significant energy uses
  - EnPIs
- The availability of monitoring data will allow for:
  - Checking the effectiveness of the action plans in achieving objectives and targets
  - Evaluation of actual versus expected energy consumption

# Monitoring – important points

- Recording of data: All monitoring and measurement results for the key characteristics are to be recorded.
- Energy measurement plan defined and implemented.
- Measuring equipment are various and wide-ranging in outputs and complexity.
- Continually review the measurement plan.
- Equipment certified to provide accurate and repeatable data.
- Calibration records to be filed.
- Immediate investigation and response to significant deviations in the energy performance.

# Monitoring – compliance & auditing

Monitoring does not only refer to the actual data monitoring of the energy consumers but also includes:

- Evaluation of **compliance** with legal and other requirements
- **Internal auditing** of the EnMS, checking for:
  - Conformity to EnMS plans
  - Conformity to energy objectives and targets
  - Implementation and maintenance of the EnMS
  - Improvements to the energy performance

Topic 10

# ENERGY PLANNING FOR REDUCING CONSUMPTION



# Tips for Effective Energy Planning

- Operational control of significant energy uses
  - Criteria for effective operation and maintenance
  - Operation and maintenance in accordance with criteria
  - Communication to all personnel involved
- New Designs
  - Including energy performance improvement opportunities in design operations.
- Procurement
  - Establish criteria for evaluation of procurement of energy services, products and equipment.
- Dealing with non-conformities

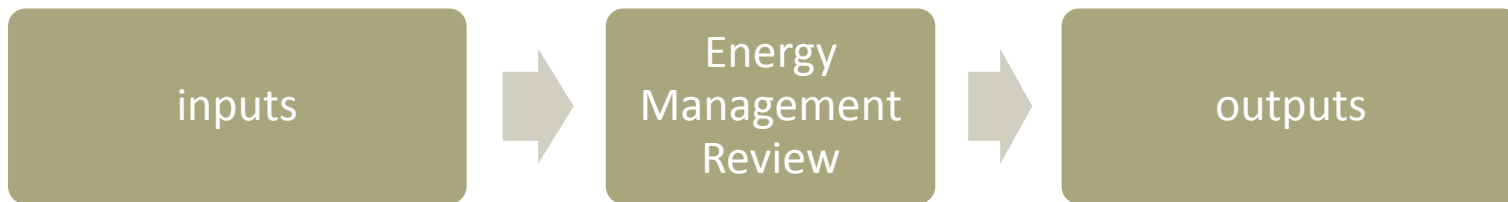
# Energy Management Plan

The most effective energy management action plans are comprised of 8 essential components:

1. Measure energy usage
2. Energy use profile
3. GHG emissions inventory
4. Teams & leadership
5. Targets & goals
6. Implementation
7. Track, measure and report
8. Train, educate and celebrate

# Management Review

The energy management review is to be done at planned intervals, involving all the energy team to ensure suitability, adequacy and effectiveness of the energy management plan.



- Follow-up on actions from previous review
- Review of the energy policy
- Review of energy performance and EnPIs
- Evaluation results
- Status to meet objectives and targets
- EnMS audit results
- Status of corrective and preventive actions
- Projected energy performance for the next period
- Recommendations for improvement

- Changes to the energy performance
- Changes to the energy policy
- Changes to the EnPIs
- Changes to objectives & targets
- Changes to allocation of resources

Topic 11

# ENERGY MANAGEMENT DOCUMENTATION SKILLS

# ISO 50001 documentation required

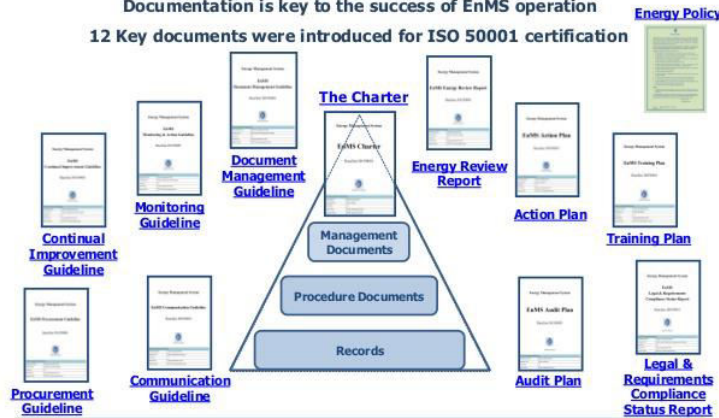
If it isn't documented, it didn't happen.



## Summary of Documentation

Documentation is key to the success of EnMS operation

12 Key documents were introduced for ISO 50001 certification



"EnMS Charter" Guidebook +t (EnMS-Charter-M01E)

41

# Energy Policy

Energy Policy



- Contents: Statement of the organisation's commitment to achieving improve in energy performance
- Aim: To commit the organisation to achieving broadly stated operational and performance goals and objectives for its EnMS while defining the means for doing so.

[http://www.energyimprovement.org/tools/2\\_Plan/2.1/FacilityEnergyPolicy-Example.pdf](http://www.energyimprovement.org/tools/2_Plan/2.1/FacilityEnergyPolicy-Example.pdf)

- The Energy Policy document is to be communicated throughout the organisation.
- The Energy Policy must also conform to ISO 9001 & 14001 standards assuming they are implemented within the organisation.
- The Energy Policy must also be in line with federal, state and local requirements, private sector professional standards and guides respecting environmental, safety and health requirements.
- The Energy Policy must meet eight criteria defined in the ISO 50001 standard:
  1. Policy appropriate to energy use.
  2. Commitment to energy performance improvement.
  3. Commitment to ensure availability of information and resources.
  4. Commitment to comply with requirements.
  5. Provide framework for setting and reviewing energy targets & objectives.
  6. Support energy efficiency in products, services and designs.
  7. Ensure all EnMS documentation is regularly reviewed and updated.
  8. Policy is communicated, documented and understood within organisation.

# EnMS Charter

**Contents:** of the energy management representative(s), the energy management team, their roles and responsibilities and the management reporting mechanism.

**Aim:** To provide the formal structure, resources and actions by which energy performance can be improved.

- **The EnMS Charter should include:**
  - Scope and boundaries of the EnMS
  - Roles, responsibilities, accountabilities and authorities of all the members of the energy team
  - Operation control methods
  - Energy policy for the organisation
  - Competence, training and awareness procedures
  - Document management requirements
  - Management review procedures



## Table of Contents

- 1. Introduction**
- 2. Scope and Boundary**
- 3. Structure & Organisation**
- 4. Guideline & Provisions**
  - 4.1 General Requirements**
  - 4.2 Management Commitments**
  - 4.3 Energy Policy**
  - 4.4 EnMS Action Plan**
  - 4.5 Implementation and Operation**
  - 4.6 Checking Performance**
  - 4.7 Management Review**
- 5. EnMS Operational Management Guideline Supplements**



# Document Management Guideline



Contents: Procedures for document control.

Aim: To maintain the documents considered necessary for ensuring planning, operation and control of the EnMS.

- Although ISO 50001 requires specific documents, the organisation may also value other documents as being necessary too.
- Documents pertaining to the EnMS include:
  - Documents that provide information, both internally and externally, about the EnMS
  - Energy plans that describe how the EnMS is specifically applied to the organisation
  - Specification documents that state requirements
  - Guideline documents that provide recommendations for improving energy performance
  - Requirement documents that provide information about how to perform activities and processes consistently.
  - Records that provide objective evidence of activities performed or energy results achieved.
- Documentation procedures to be defined include:
  - Approval of documents before initial publication
  - Periodic review and updating
  - Identify changes and correct revisions
  - Ensure that relevant document versions are available where needed
  - Ensure that documents are legible and readily identifiable
  - Control of external documents
  - Prevent the unintended use of obsolete documents

# Energy Review Report



Energy Review  
Report

- Contents:** A methodology and criteria for the energy review activity that is documented and uses readily available data, e.g. energy costs, major equipment list and their condition, etc.
- Aim:** To target opportunities to be developed in later planning stages such as energy technologies and source substitutions, including renewables, electronic control applications, material substitutions, and replacement of selective system components and logistical considerations.
- The Energy Review serves to provide the energy planning process with a good sense of target opportunities for energy reduction.
  - It provides inputs to guide the energy baseline and selection of EnPIs.
  - The review must be done by qualified energy engineering auditors.
  - The contents of the report should include:
    - Planning for review operations.
    - Identification of any data gaps to be addressed.
    - Statements of strategic purpose and direction to guide the implementation of the Energy Policy.
    - Steps to be followed to produce the performance evidence.
    - Clear statements of management expectations for validating and recording performance documented by a schedule of progress reports to management.

# Action Plan



**Contents:** A methodology and criteria for the energy review activity that is documented and uses readily available data, e.g. energy costs, major equipment list and their condition, etc.

**Aim:** To target opportunities to be developed in later planning stages such as energy technologies and source substitutions, including renewables, electronic control applications, material substitutions, and replacement of selective system components and logistical considerations.

- The planning process must be grounded on the realities of the system environment that it seeks to alter. A realistic plan is more likely to be successful.
- All plans must be in line with the Energy Policy.
- Evidence supporting the planning process is required.
- The energy management action plans shall include:
  - Designation of responsibilities
  - Means and timeframes by when individual targets will be achieved
  - Statements of the methods by which improvements in energy performance are verified
  - Statements of the methods of verifying the results of the action plan.

# Training Plan

Contents: Training plans for proper EnMS operation by all employees.

Aim: Aims are to:

- Ensure any person(s) whose work is related to significant energy uses are competent on the basis of appropriate education, training, skills, or experience.
  - Identify training needs associated with the control of its significant energy uses and the operation of its EnMS.
  - Provide training or take other actions to meet these needs.
  - Maintain associated records.
- Persons requiring training can be split into groups:
    - Management level
    - Energy management team
    - All persons working in the boundaries
    - All persons working for the organisation
    - All persons working on the organisation's behalf
    - Others
  - The training should include:
    - Awareness of the importance of conformity with the energy policy, procedures and with the requirements of the EnMS
    - roles, responsibilities and authorities in achieving the EnMS requirements
    - the benefits of improved energy performance
    - the impact, actual or potential, with respect to energy consumption, of the learners activities and how their activities and behaviour contribute to the achievement of energy objectives and targets, and the potential consequences of departure from specified procedures



# Audit Plan



The **Content** objectives and coverage also assigning responsibility and ensuring that necessary resources are available.

To **define** the plan, scope and execution of the internal audits performed by the organisation.

- The term “internal” audit means that they are done internally within the organisation. They may be performed by employees as well as by independent auditors.
- Staff should not audit their own work, processes or areas for which they are responsible.
- An audit program manager is appointed. Responsibilities include scheduling audits, evaluating auditors, selecting audit teams, directing audit activities and maintaining records.
- When auditing an EnMS, the auditor asks the following questions in relation to each process:
  - Is the process identified and appropriately defined?
  - Are roles, responsibilities, authorities, and accountabilities assigned?
  - Are the procedures being implemented and maintained?
  - Is the process effective in achieving the organization’s desired results?

# Monitoring Guideline

**Contents**  
Requirements and methodology for checking the performance of the EnMS within the organisation.

**Aim:**  
To ensure that the key characteristics of the organisation's operation determining energy performance are monitored, measured and analysed at planned intervals.

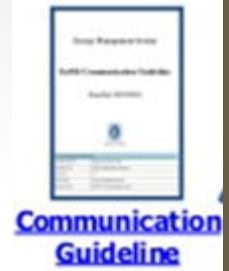


- The key characteristics to be monitored include, at a minimum:
  - The outputs of the energy review
  - Significant energy uses
  - Relationship between significant energy use and consumption
  - Energy performance indicators (EnPIs)
  - Effectiveness of the action plans in achieving objectives and targets
- Equipment used for monitoring and measuring should provide data which is accurate and reliable. Calibration records are to be maintained.
- The organisation shall also monitor compliance with legal and other requirements at planned intervals.

# Communication Guideline

Guideline for internal and external communications.

**Aim:** To promote awareness of the energy policy and objectives at all levels of the organisation via structured communication controls and procedures.



- The communication guideline should discuss the following elements:
  - Background of the energy-related communication
  - Purpose of communicating energy performance and the EnMS
  - Assessment of the organisation's communications culture
  - Stakeholders for improving energy performance
  - Goals and objectives of energy performance-improvement activities
  - Audiences to receive messages
  - Key messages to be communicated
  - Communication channels within the organisation
  - Communication products to be developed
  - Communication activities to be implemented
  - Evaluation of communication effectiveness
- One output of the communication plan is a communications package that includes:
  - Communications responsibilities
  - Overview of the organization's energy performance
  - Energy improvement snapshot and briefing notes
  - Improvement summary and schedule
  - Questions and answers
  - Answer the question, "What does this mean to me?"
  - Specific actions required from personnel



# Continual Improvement Guideline



Continual  
Improvement  
Guideline

Contents:

Procedures for dealing with actual and potential nonconformities, taking corrective action, and taking preventive

Aim:

Capability to identify and eliminate a nonconformity and its cause and eliminate the cause of problems that could potentially occur.

- Definitions:
  - Corrective action: to ensure that a problem does not occur again
  - Preventive action: to prevent non-conformities from occurring
  - Root-cause analysis: to determine the cause of an incident or non-compliance
  - Non-conformance: a deviation from the EnMS requirements
  - Non-compliance: a deviation from government laws or regulations
- The guidelines should include clear, written instructions on how to deal with actual and potential problems.
  - reviewing nonconformities or potential nonconformities
  - determining the causes of nonconformities or potential nonconformities, e.g. through Failure Mode and Effects Analysis (FMEA)
  - evaluating the need for action to ensure that nonconformities do not occur or reoccur
  - determining and implementing the appropriate action needed
  - maintaining records of corrective and preventive actions
  - reviewing the effectiveness of the corrective or preventive action taken
- All corrective and preventive actions are to be documented.

# Procurement Guideline



Procurement  
Guideline

Contents: Guidelines for procurement evaluation on the basis of performance for services, products and equipment.

Aim: To inform prospective suppliers about energy-related purchasing criteria.

- Procurement of energy services, products and equipment represents an opportunity to directly improve energy performance through the use of more energy-efficient products and services.
- It also promotes partner relationships with the supply chain and influences their energy behaviours.
- The Procurement Guidelines should include criteria for energy procurement as well as product, service and equipment procurement.
- The guidelines also include criteria for assessing energy use over the planned or expected operating lifetime of energy-using products, equipment and services.
- The guidelines should also include contingency and emergency planning for potential disasters relating to equipment to ensure the availability of the needed energy or replacement of equipment. Benefits of the contingency planning include:
  - Minimised business interruption, downtime.
  - Minimised financial impact of the interruption to operation.
  - Increased job security, improved productivity.
  - Increased ability to avoid business interruptions.
  - Improved organisational resilience to adverse conditions.

# Legal & Regulatory Compliance Status



**Contents:** The contents for evaluating compliance with legal and other requirements to which the organisation subscribes and that are relevant to energy use.

**Aim:** To monitor progress against planned milestones and avoid violations of laws and regulations, as well as lawsuits.

- Ensure that applicable milestones related to legal and other requirements are included in the management of objectives, targets and action plans.
- Identify applicable legal and other requirements to which the organisation subscribes
- Compliance is to be checked at regular, planned intervals.
- Records of compliance are to be kept.
- Significant deviations from planned performance expectations are highlighted to the management team.

Topic 12

# ENERGY EFFICIENCY KNOWLEDGE TRANSFER FRAMEWORK

# The Knowledge Transfer Framework Concept

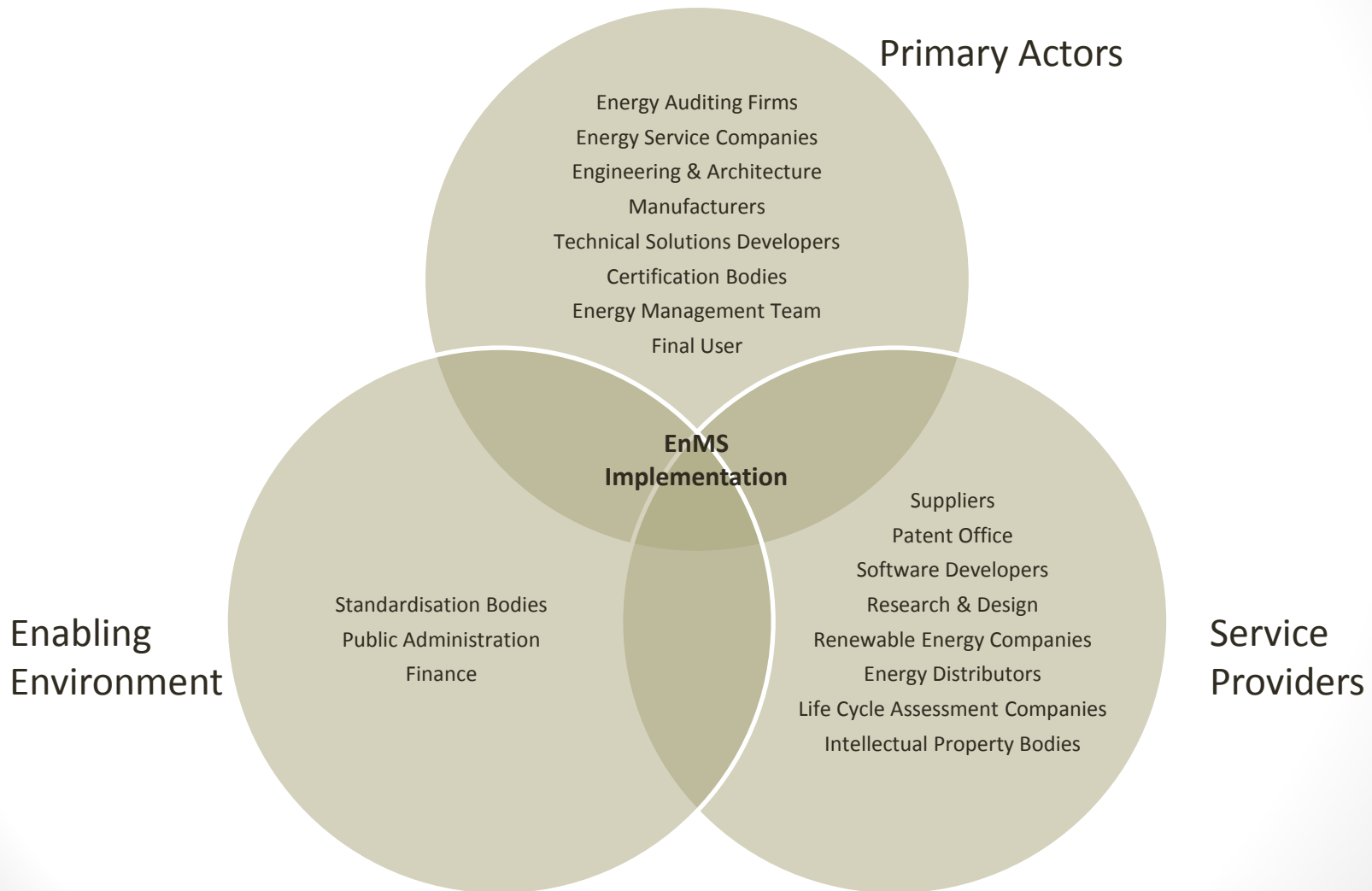
- The Knowledge Transfer Framework (KTF) is a conceptual framework showing the translation of knowledge into action.
- The KTF describes the complete set of processes and activities required from concept to design and implementation.
- It includes all the primary activities as well as the interacting and supporting channels that are able to influence the task at hand.
- Components of the framework are:
  - the primary actors
  - the enabling environment
  - the service providers

# KTF Key Players in the EnMS Scenario

Example of key players categorised into groups:

- Public Administration
  - National authorities
  - Regional authorities
  - Local authorities
- Finance
  - Banks
  - Financial Agents
  - Promoters
  - Subsidisers
- Energy Auditing Firms
- Energy Service Companies
- Energy Distributors
- Renewable Energy Companies
- Energy Management Team
- Final Users
- Engineering & Architecture
- Research & Design
  - In-house design department
  - Universities, external sources
- Technical Solutions Developers
- Manufacturers / Suppliers
- Software Developers
- Standardisation Bodies
- Certification Bodies
- Life Cycle Assessment Companies
- Intellectual Property Bodies
- Patent Offices

# Interactions between the KTF players

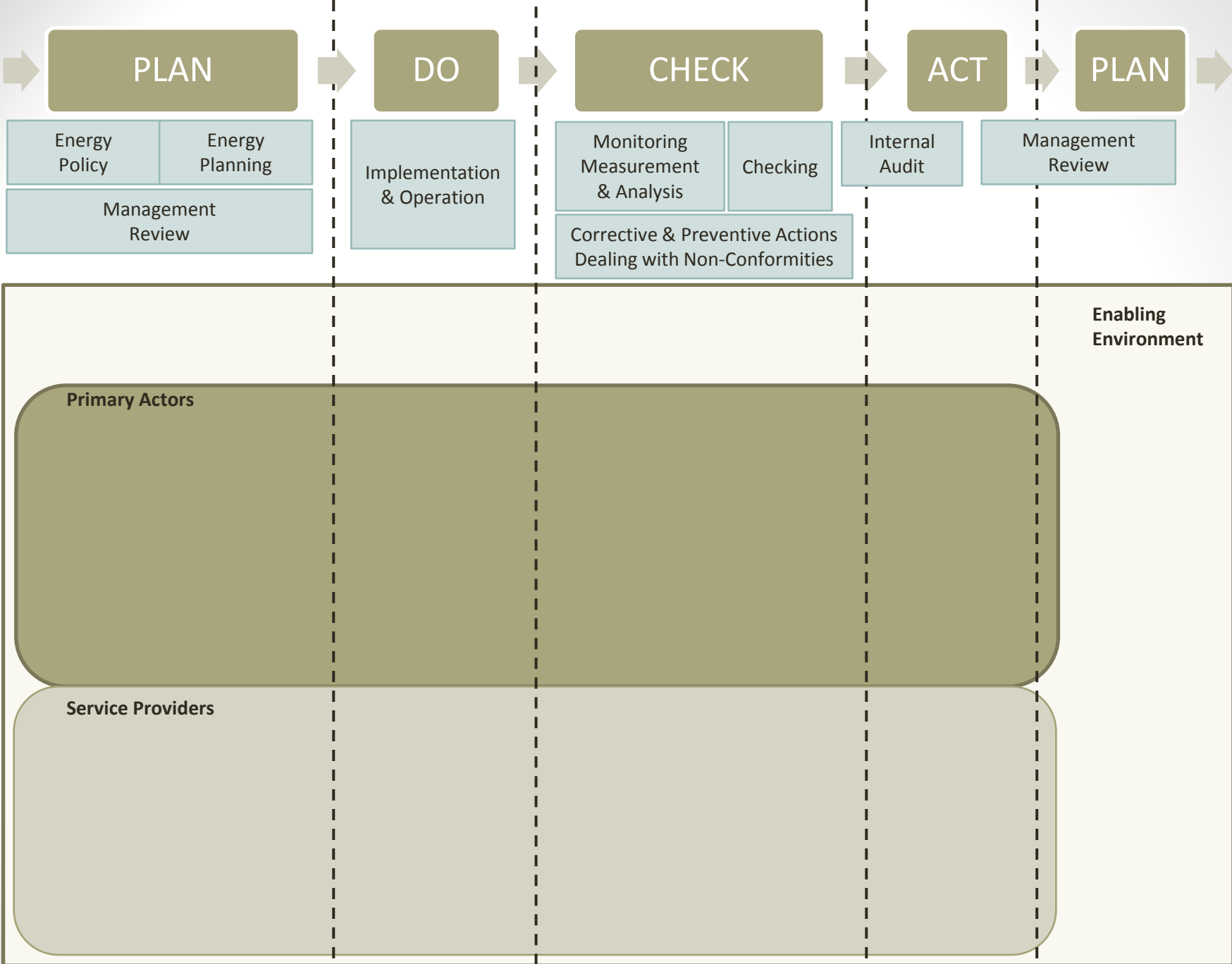


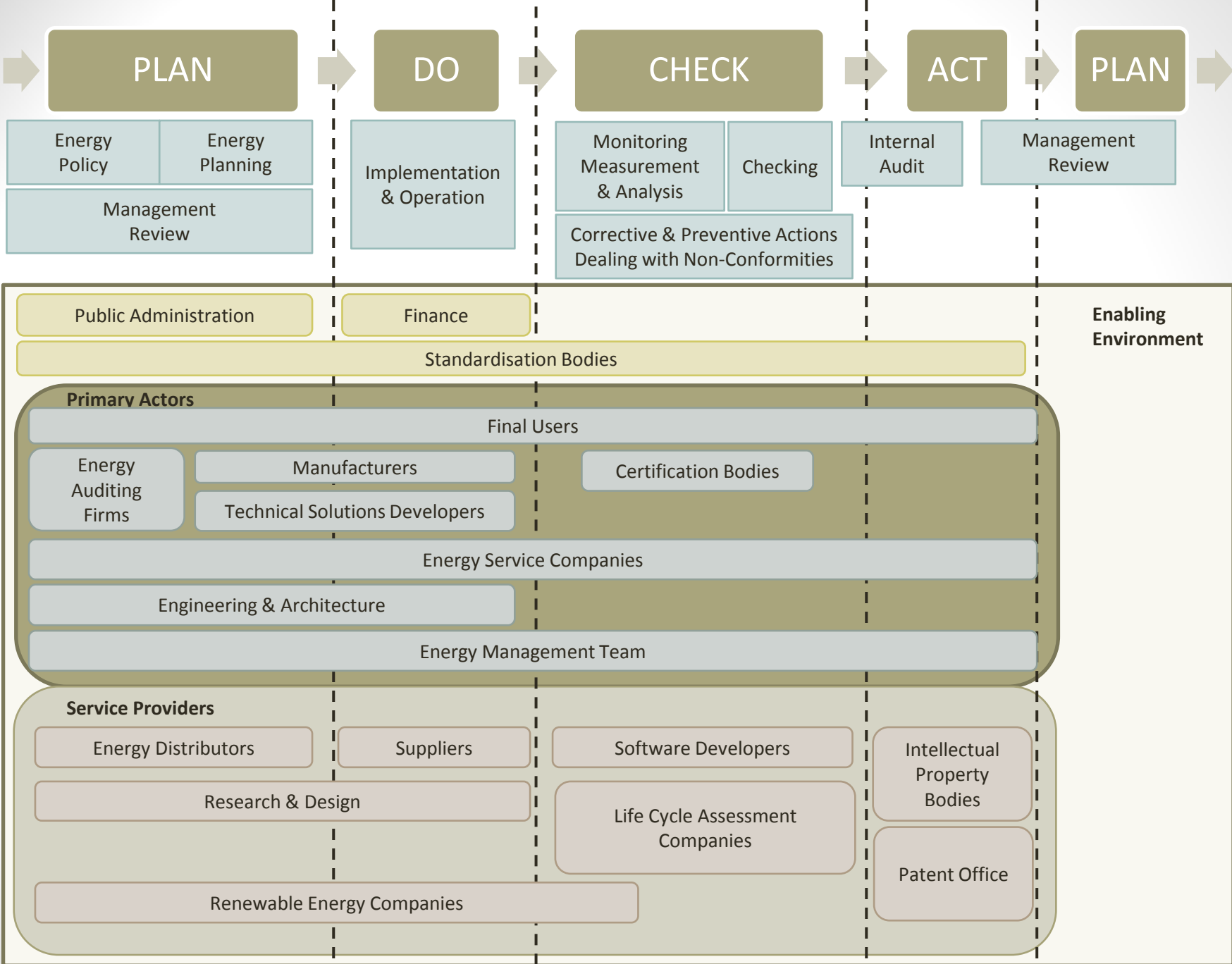


# Drawing up the framework

Drawing up the KTF conceptual diagram:

- Start off with the blank framework (next slide)
- The primary actors, enabling environment and service providers are shown in separate blocks.
- Assign each of the key players to the steps of the PDCA process according to the role they play.
- Each of the key players may have roles to play in more than one PDCA process.
- An example of the KTF is shown in the next slides.





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THANK YOU

# Modulu 3

## Sistemi ta' Ġestjoni tal-Energija

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# Course Content

- Module 1 – Building / Organisation Energy
  - Topic 1: Definitions of common energy terminology
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Topic 13

# IMPLEMENTING AN ENMS WITHIN AN ORGANISATION



# Demonstrating conformity to ISO 50001

- The energy performance requirements for each organisation are not established by the ISO 50001 standard but by the organisation itself.
- Demonstration of conformity to ISO 50001 can be done via:
  - Certification by an external organisation
  - Self-evaluation and self-declaration



# Benefits of certification

- Certification involves an independent assessment of the organisation's implementation of the EnMS.
- Benefits from certification include:
  - Competitive advantage
  - Supply chain requirements
  - Financial benefits, cost savings, insurance audits
  - Certified businesses outperform
  - Rigour and independence of audits
  - Consistency across multiple sites
  - Protect brand and reputation
  - Drive continuous improvement



# The ISO 50001 Certification Process



# Top management role for EnMS implementation

Top management must be involved immediately from the first stages of EnMS implementation.

- defining, establishing, implementing and maintaining an **energy policy**
- appointing a **management representative** and approving the formation of an energy management team
- providing the **resources** needed to establish, implement, maintain and improve the EnMS and the resulting energy performance
- identifying the **scope and boundaries** to be addressed by the EnMS
- **communicating** the importance of energy management to those in the organization
- ensuring that:
  - energy **objectives and targets** are established
  - **EnPIs** are appropriate to the organization
  - results are **measured and reported** at determined intervals
- considering energy performance in **long-term planning**
- conducting **management reviews**

# Duties of the energy manager

The appointed person must have the appropriate skills and competences and will be given the responsibility and authority to:

- ensure the EnMS is established, implemented, maintained, and continually improved in **accordance with ISO 50001 standard**
- Identify **supporting person(s)**, authorized by an appropriate level of management, to work with the management representative on the EnMS
- **report** to top management on energy performance and on the performance of the EnMS
- ensure that the **planning of energy management activities** is designed to support the organization's energy policy
- define and communicate **responsibilities and authorities** in order to facilitate effective energy management
- determine **criteria and methods** needed to ensure that both the operation and control of the EnMS are effective
- promote **awareness of the energy policy and objectives** at all levels of the organization.

# Module 3: Assignment #2

Write a proposal addressed to the top management of an organisation to advocate for the implementation of an EnMS.

Describe all the benefits the organisation might take advantage of, the opportunities it presents in terms of competitive advantages and why you should be appointed as the energy manager for taking the EnMS from design to implementation and operation.

Expected time employed: 20 hours

# Module 3: Final Assignment

Write a report discussing the main requirements for a successful EnMS implementation considering the aspects of monitoring, planning, documentation and knowledge transfer.

Identify vital characteristics of good operation together with the benefits they each present.

Expected time employed: 50 hours



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THANK YOU



# Kors: Sistemi Applikati ta' Ġestjoni tal-Energija f' /għall- organizzazzjonijiet (inklużi skejjel)

Course Portfolio: Applied Energy Management Systems in/for organisations  
(including schools)



O2: Portafoll Ambjentali / Environmental Portfolio

Kors żviluppati minn / Course developed by: Projects in Motion (Malta)

Koordinatur tal-proġett / Project Coordinator: University of Ioannina (Greece)

Imsieħba tal-Proġett / Project Partners

- Helsingin Yliopisto (Finland)
- Hellenic Open University (Greece)
- Università degli Studi di Napoli Federico II (Italy)
- BEST Institut für berufsbezogene Weiterbildung und Personaltraining GmbH (Austria)
- Projects in Motion (Malta)

# Course Content

- Module 1 – Building / Organisation Energy
  - Topic 1: Definitions of common energy terminology
  - Topic 2: Energy sources
  - Topic 3: Energy trends within the EU
  - Topic 4: EU energy priorities and energy saving strategies
- Module 2 – Energy Standards & Directives
  - Topic 5: Energy directives
  - Topic 6: Energy standards
  - Topic 7: Benefits from EnMS implementation
- Module 3 – Energy Management Systems
  - Topic 8: Plan-Do-Check-Act process
  - Topic 9: Energy monitoring techniques
  - Topic 10: Energy planning for reducing consumption
  - Topic 11: Energy management documentation skills
  - Topic 12: Energy Efficiency Knowledge Transfer Framework
  - Topic 13: Implementing an EnMS within an organisation
- Module 4 – Case Study

The teaching language at the University of Malta is English and therefore the course content is being presented in the English language to be used by any Maltese students/learners.

Il-lingwa tat-tagħlim fl-Università ta' Malta hija l-Ingliż u għalhekk il-kontenut tal-kors qed jiġi ppreżentat bil-lingwa Ingliża għal-użu tal-istudenti Maltin.

# Who Should Attend?

This course is targeted to:

- Managers of SMEs with schools as a primary focus.
- Employees responsible for energy management
- Those interested in improving energy performance and energy efficiency
- Individuals who want to learn more about ISO 50001.
- Individuals who want to implement an ISO 50001 EMS.
- Energy managers and energy coordinators (engineers, plant managers, etc.)

## Pre-requisites

- There are no formal prerequisites for this course

# Expected Learning Outcomes

After course completion, the learner will be able to:

- Discuss and explain the **purpose and benefits** of an EnMS.
- Understand the requirements of **ISO 50001**.
- **Assess** the energy performance characteristics for a particular building/area.
- Develop a **policy** for more efficient use of energy within the building/area.
- Fix **targets** and **objectives** to assist in meeting the policy.
- Use **data** to better understand and make decisions about energy use and energy conservation.
- **Monitor** and **measure** the energy consumption and energy savings.
- **Review** how well the designed policy works.
- Continually **improve** energy management policies, targets and monitoring systems.

# Module 4

## Field Work

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# Module 4: EnMS Field Work

To put in practice all the topics covered in Modules 1, 2 & 3 via the analysis of an energy system within a school ambience.

The student is to produce the necessary documentation, analysis reports, monitoring tools, knowledge transfer frameworks and time plans for the implementation of an EnMS structure within the school.

Expected time employed: 180 hours



# Module 4: EnMS Field Work

Features to be covered in the field work are:

- **Create an Energy Policy:** top management's official statement of the organisation's commitment to managing energy.
- **Formulate an Energy Management Plan** that requires measurement, management, and documentation for continuous improvement for energy efficiency.
- **Appoint a cross-divisional management team** led by a representative who reports directly to management and is responsible for overseeing the implementation of the strategic plan.
- **Define operating controls and procedures** to address all aspects of energy purchase, use, and disposal.
- **Establish a baseline** of the organisation's energy use. Progress will be measured against this deadline.
- **Identify energy performance indicators** that are unique to the organisation and are tracked to measure progress.
- **Define energy objectives and targets** for energy performance improvement at relevant functions, levels, processes or facilities within the organisation.
- **Draw up action plans** to meet those targets and objectives.
- **Create all required manuals/reports**, these living documents evolve over time as additional energy saving projects and policies are undertaken and documented.
- **Establish periodic reporting of progress** to management based on these measurements.
- **Set up a Knowledge Transfer Framework** to be the basis of all planning and operations.

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## THANK YOU

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