Research Ideas and Outcomes 4: e31412
doi: 10.3897/rio.4.e31412

Grant Proposal

Increasing understanding of alien species through citizen science (Alien-CSI)

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Reviewable v1

Received: 06 Nov 2018 | Published: 07 Nov 2018

Citation: Roy H, Groom Q, Adriaens T, Agnello G, Antic M, Archambeau A, Bacher S, Bonn A, Brown P, Brundu G, López B, Cleary M, Cogălniceanu D, de Groot M, De Sousa T, Deidun A, Essl F, Fišer Pečnikar Ž, Gazda A, Gervasini E, Glavendekic M, Gigot G, Jelaska S, Jeschke J, Kaminski D, Karachle P, Komives T, Lapin K, Lucy F, Marchante E, Marisavljevic D, Marja R, Martín Torrijos L, Martinou A, Matosevic D, Mifsud C, Motiejūnaitė J, Ojaveer H, Pasalic N, Pekárik L, Per E, Pergl J, Pesic V, Pocock M, Reino L, Ries C, Rozylowicz L, Schade S, Sigurdsson S, Steinitz O, Stern N, Teofilovski A, Thorsson J, Tomov R, Tricarico E, Trichkova T, Tsiamis K, van Valkenburg J, Vella N, Verbrugge L, Vétek G, Villaverde C, Witzell J, Zenetos A, Cardoso A (2018) Increasing understanding of alien species through citizen science (Alien-CSI). Research Ideas and Outcomes 4: e31412. https://doi.org/10.3897/rio.4.e31412

Abstract

There is no sign of saturation in accumulation of alien species (AS) introductions worldwide, additionally the rate of spread for some species has also been shown to be increasing. However, the challenges of gathering information on AS are recognized. Recent developments in citizen science (CS) provide an opportunity to improve data flow and knowledge on AS while ensuring effective and high quality societal engagement with the issue of IAS (Invasive Alien Species). Advances in technology, particularly on-line recording and smartphone apps, along with the development of social media, have revolutionized CS and increased connectivity while new and innovative analysis techniques are emerging to ensure appropriate management, visualization, interpretation and use and sharing of the data. In early July 2018 we launched a European CO-operation in Science and Technology (COST) Action to address multidisciplinary research questions in relation to developing and implementing CS, advancing scientific understanding of AS dynamics while informing decision-making specifically implementation of technical requirements of relevant legislation such as the EU Regulation 1143/2014 on IAS. It will also support the EU biodiversity goals and embedding science within society. The Action will explore and document approaches to establishing a European-wide CS AS network. It will embrace relevant innovations for data gathering and reporting to support the implementation of monitoring and surveillance measures, while ensuring benefits for society and citizens, through an AS CS European network. The Action will, therefore, increase levels of participation and quality of engagement with current CS initiatives, ensuring and evaluating educational value, and improve the value outcomes for potential users including citizens, scientists, alien species managers, policy-makers, local authorities, industry and other stakeholders.

Keywords

public participation in science, invasive species, monitoring, public awareness, visualisation, communication, conservation

Translations of the Abstract

Alien-CSI is an international project that aims to interact with citizen science projects all over Europe and elsewhere. Although the use of English in scientific communication does aids communication among scientists it is widely recognised that it can be a barrier to communication, particularly to the those working on local environmental issues (Amano et al. 2016). To facilitate this communication the management committee have translated the abstract of the proposal into their own languages.

Bosanski (Bosnian)

Povećanje razumijevanja značaja stranih vrsta kroz uključenje građana u istraživanja (Alien - SCI)

U svijetu još uvijek nema znakova da je došlo do zasićenja unošenja stranih vrsta (SV), dok je sa druge strane evidentan porast i brzina širenja nekih stranih vrsta. Ipak, izazovi i značaj prikupljanja podataka o SV su prepoznati. Novijim napretkom u povećanju uključivanja građana u istraživanja (CS - od eng. "citizen science") nudi se velika mogućnost poboljšanja protoka podataka i znanja o SV, uz istovremeno osiguranje efikasnog i visoko vrijednog društvenog angažovanja po pitanju invazivnih stranih vrsta (ISV). Tehnološki napredak, posebno on line evidentiranje kao i aplikacije na pametnim telefonima, uz razvoj društvenih mreža, iz korijena mijenjaju ulogu CS i omogućavaju veću povezanost svih aktera. Istovremeno se razvijaju nove i inovativne analitičke tehnike koje imaju za cilj da obezbijede odgovarajuće upravljanje, vizualizaciju, tumačenje, primjenu i razmjenu prikupljenih podataka. Početkom jula 2018. godine pokrenuta je COST akcija (eng. COST - saradnja u nauci i tehnologiji) koja ima za cilj multidisciplinaran pristup istraživačkim problemima vezanim za razvoj i primjenu CS, razvoj razumijevanja dinamike SV, informisanje donosioca odluka sa naglaskom na sprovođenje tehničkih zahtijeva relevantnih zakona kao što je Uredba EU 1143/2014 o ISV. Akcija podržava i ciljeve EU o očuvanju biološke raznovrsnosti, te će pomoći da se nauka bolje ugradi u društvo. Kroz ovu akciju će se takođe i istraživati i dokumentovati pristup organizovanju mreže CSSV širom Evrope. Kroz evropsku mrežu CSSV promovisaće se relevantne inovacije za prikupljanje podataka i izvještavanje kao podrška primjeni novih mjera praćenja i nadzora, istovremeno osiguravajući dobrobit za zajednicu i građane. Akcija će uticati na povećanje nivoa učestvovanja i kvaliteta angažmana sa postojećim CS inicijativama, obezbjeđujući i stimulišući edukativne vrijednosti, te uticati da rezultat akcije bude koristan i upotrebljiv za sve potencijalne korisnike, uključujući građane, naučnike, stručnjake u oblasti upravljanja zaštićenim područjima, kreatore politike, lokalne vlasti, industriju i druge učesnike.

Български (Bulgarian)

Повишаване на познанията за чуждите видове с помощта на гражданската наука (Alien CSI)

В световен мащаб продължава тенденцията на въвеждане на инвазивни чужди видове (ИЧВ), като темповете на разпространяване на някои от тях се увеличават. В същото време събирането на данни за чуждите видове поставя редица предизвикателства. Развитието на гражданската наука през последните години предоставя възможности за подобряване на обмена на данни и знания за чуждите видове, като същевременно осигурява ефективна и висококачествена обществена ангажираност с проблемите, свързани с тях. Напредъкът в технологиите, като онлайн записването и приложенията за смартфони, едновременно с развитието на социалните медии, дават огромни възможности за развитието на гражданската наука. Появяват се нови и иновативни техники за анализ, които осигуряват

подходящо управление, визуализация, интерпретиране, използване и споделяне на данните.

Настоящата COST Акция е насочена към решаването на мултидисциплинарни изследователски въпроси във връзка с развитието и прилагането на гражданската наука, както и повишаването на научните познания за динамиката на чуждите видове, което ще доведе до информирано вземане на решения при изпълнението на техническите изисквания на съответните нормативни уредби, като например Регламент (ЕС) № 1143/2014 на ЕС за ИЧВ. COST Акцията ще допринесе за изпълнение на целите на ЕС в областта на биологичното разнообразие и за по-широко вграждане на науката в обществото; ще проучи и документира подходите за изграждане на обща Европейска мрежа за гражданска наука за чуждите видове; ще обхване съответните нововъведения за събиране и докладване на данни в подкрепа на прилагането на мерки за мониторинг и наблюдение и ще осигури ползи за обществото и гражданите чрез Европейската мрежа за гражданската наука за чуждите видове. COST Акцията ще повиши равнището на участие и качеството на ангажираност в настоящите инициативи на гражданската наука, ще оцени и подобри тяхната образователната стойност и така ще гарантира по-добри резултати за потенциалните потребители като гражданите, учените, политиците, местните власти, бизнеса и другите заинтересовани страни.

Català (Catalan)

Augmentant el coneixement sobre les espècies exòtiques mitjançant la ciència ciutadana (Alien-CSI)

No hi ha cap senyal de saturació en l'acumulació d'introduccions d'espècies exòtiques (EE) arreu el món, i, a més, s'ha demostrat que la taxa de propagació d'algunes espècies augmenta. La recopilació d'informació sobre les EE és un dels reptes reconeguts més importants. Els avenços recents en ciència ciutadana (CC) representen una oportunitat per millorar el flux de dades i el coneixement sobre les EE, alhora que es garanteix un compromís social efectiu i de gran qualitat en relació a les espècies exòtiques invasores (EEI). Els avenços en la tecnologia, especialment en el registre «en línia» i en les aplicacions per a telèfons intel·ligents, juntament amb el desenvolupament de les xarxes socials, han revolucionat la CC i han augmentat la connectivitat, paral·lelament a l'aparició de tècniques d'anàlisi noves i innovadores que guaranteixen una gestió, visualització, interpretació i ús adequades de les dades. Aquesta Acció abordarà qüestions de recerca multidisciplinàries en relació amb el desenvolupament i implementació de la CC, avançant en la comprensió científica de les dinàmiques de les EE, alhora que informarà a la presa de decisions, específicament en relació a la implementació dels requisits tècnics de la legislació vigent, com el Reglament de la UE 1143/2014 sobre les EEI. També donarà suport als objectius de la biodiversitat de la UE i incorporarà la ciència dins de la societat. L'Acció explorarà i documentarà aproximacions per establir una xarxa de CC d'EE a nivell europeu. Incorporarà les innovacions necessàries per a la recollida de dades i la proporció d'informes, per recolzar la implementació de mesures de seguiment i de vigilància,

garantint beneficis per la societat i els ciutadans, a través d'una xarxa europea de CC sobre EEI. L'Acció, per tant, augmentarà els nivells de participació i la qualitat del compromís amb les iniciatives actuals del CC, assegurant i avaluant el seu valor educatiu, i millorarà els resultats per als usuaris potencials, inclosos ciutadans, científics, gestors d'EEI, responsables polítics, autoritats locals, la indústria i altres parts interessades.

Hrvatski (Croatian)

Povećavanje razumijevanja stranih vrsta uključivanjem javnosti u istraživanja (Alien-CSI)

Diljem Zemlje nema znakova zasićenja pridolaska novih stranih vrsta (AS – od eng. „alien species“), dok je brzina širenja nekih vrsta i u porastu. Stoga su prepoznati izazovi pri prikupljanju podataka o stranim vrstama. Uočeno povećavanje uključivanja javnosti u istraživanja (CS – od eng. „citizen science“) pruža mogućnosti da se poboljša protok podataka i znanje o AS uz istovremeno osiguravanje učinkovitog i kvalitetnog društvenog angažmana po pitanjima invazivnih stranih vrsta (IAS). Razvoj tehnologije, prvenstveno mrežno (on-line) bilježenje i aplikacije na pametnim telefonima, uz razvoj društvenih mreža, revolucionalizirali su CS i povećali povezanost svih uključenih. Uz to, pojavljuju se inovativne analitičke tehnike koje osiguravaju prikladno upravljanje, vizualizaciju, interpretaciju, korištenje i dijeljenje podataka. Početkom srpnja 2018 pokrenuli smo Europsku COST („CO-operation in Science and Technology“ – suradnja u znanosti i tehnologiji) Akciju koja za cilj ima multidisciplinarno pristupiti istraživačkim problemima vezanim uz razvoj i primjenu CS, razvijati razumijevanje dinamike AS na znanstvenim osnovama, uz obavještavanje donositelja odluka s naglaskom na primjenu tehničkih zahtjeva povezane legislative popu EU Uredbe 1143/2014 o IAS. Dodatno, podržat će ciljeve EU vezane za biološku raznolikost, te uklapanje znanosti u zajednicu. Akcija će istražiti i zabilježiti pristupe za uspostavu CS AS mreže diljem Europe. Promovirat će relevantne inovacije za prikupljanje i izvještavanje podataka kao potporu primjeni mjera opažanja i praćenja, istovremeno osiguravajući dobrobit za zajednicu i građane, kroz AS CS Europsku mrežu. Akcija će stoga povećati razinu sudjelovanja i kvalitetu uključenosti kroz trenutne CS inicijative, osigurati i vrednovati obrazovnu vrijednost, te poboljšati upotrebljivost CS podataka mogućim korisnicima poput: građana, znanstvenika, nadležnih za strane vrste, donositelja odluka, lokalnih vlasti, industrije i ostalih dionika.

Česky (Czech)

Zvýšení znalostí o nepůvodních druzích pomocí občanské vědy (citizen science)

Počet introdukcí nepůvodních druhů v celosvětovém měřítku stále stoupá, stejně jako rychlost šíření některých z nich. Zájem o nepůvodní druhy však umožnil identifikovat problémy spojené se získáváním informací o nich. Současné pokroky v oblasti občanské vědy (citizen science) poskytují příležitost ke zlepšení sběru dat a znalostí o nepůvodních druzích zaručující efektivní a vysoce kvalitní zapojení veřejnosti do problematiky invazních druhů. Pokroky v technologii, zejména on-line zaznamenávání dat a aplikace v chytrých

telefonech, spolu s rozvojem sociálních médií, revolučně změnily občanské vědy. Ke změnám postupně došlo, jelikož se objevily nové a inovativní techniky analýzy zajišťující vhodný management, vizualizaci, použití a sdílení dat. Projekt COST se bude zabývat multidisciplinárními výzkumnými otázkami v souvislosti s vývojem a využitím občanské vědy, dále budou využity data o rozšíření k porozumění dynamiky šíření nepůvodních druhů a zároveň dojde k propojení s legislativními nástroji, jako je nařízení EU 1143/2014 o invazních druzích. Taktéž budou podpořeny cíle EU v oblasti ochrany biologické rozmanitosti a zakotvení vědy ve společnosti. Projekt bude zkoumat a dokumentovat pokroky ve vytváření celoevropské sítě občanské vědy pro nepůvodní druhy. Ta bude zahrnovat shromažďování dat o výskytu, monitoringu a managementu s cílem podpořit efektivní a trvale udržitelné nakládaní s nepůvodními druhy. Projekt zvýší úroveň a efektivitu zapojení rozličných existujících národních systémů občanské vědy, zajistí a vyhodnotí jejich vzdělávací potenciál a zlepší přínos pro potencionální uživatele zahrnující jak širokou veřejnost, tak i vědce, osoby zabývající se managementem nepůvodních druhů, zemědělce, lesníky i pracovníky veřejné správy.

Nederlands (Dutch)

Kennisontwikkeling over exoten via burgerwetenschap (Alien CSI)

Het aantal introducties van exoten (uitheemse plant- en diersoorten) neemt wereldwijd nog steeds toe, evenals als de snelheid waarmee sommige soorten zich verspreiden. Het verzamelen van informatie over de verspreiding van exoten is niet zonder moeilijkheden. Recente ontwikkelingen op het gebied van burgerwetenschap (ook wel ‘citizen science’ genoemd) versnellen en verbeteren de doorstroming van gegevens en kennis over exoten Tegelijk bieden ze de mogelijkheid om de maatschappelijke betrokkenheid bij de exoten problematiek te vergroten. Technologische vooruitgang, en online waarnemingsportalen, smartphone applicaties en sociale media in het bijzonder, hebben een revolutie teweeggebracht in citizen science (CS) door het creëren van nieuwe digitale netwerken. Daarnaast komen er steeds meer nieuwe analysetechnieken beschikbaar gericht op beheer, visualisatie, interpretatie en het delen van data. Begin juli 2018 lanceerden we een nieuwe actie binnen het programma voor Europese samenwerking op het gebied van wetenschap en technologie (COST). De Actie richt zich op het beantwoorden van multidisciplinaire onderzoeksvragen over de ontwikkeling en implementatie van CS, het vergroten van de wetenschappelijke kennis over de dynamiek van exoten. Ze wil hiermee de besluitvorming en de implementatie van specifieke relevante wetgeving zoals de EU-verordening 1143/2014 betreffende invasieve exoten ondersteunen. Ze geeft ook uitvoering aan de EU-biodiversiteitsdoelstelling en en aan de inbedding van wetenschap in de samenleving. De Actie zal verschillende benaderingen voor het opzetten van een Europees CS netwerk rond exoten verkennen en beschrijven. Ze zal innovaties op het gebied van dataverzameling en rapportage in kaart brengen voor monitoring en surveillance. Tegelijkertijd wil ze de voordelen voor de maatschappij en burgers waarborgen. De Actie heeft als doel om het niveau van burgerparticipatie en de kwaliteit van de betrokkenheid bij huidige CS-initiatieven te verhogen en wil de educatieve waarde ervan bestendigen en evalueren. Uiteindelijk wil de Actie kennis en tools ontwikkelen die tegemoet komen aan de

noden van potentiële gebruikers, waaronder burgers, wetenschappers, beheerders, beleidsmakers, regionale en lokale overheden, het bedrijfsleven en andere belanghebbenden.

Eesti (Estonian)

Parem arusaamine võõrliikidest läbi harrastusteaduse

Võõrliikide vohamine ei näita ülemaailmselt küllastumise märke ning laienenud on mitmete võõrliikide levik. Vaatamata sellele esineb siiani raskusi vajaliku teabe kogumisega võõrliikide kohta. Viimased suundumused harrastusteaduses võimaldavad seda olukorda parandada uute andmete ja teabe kogumise kaudu kaasates efektiivselt tavakodanikke. Tehnoloogilised arengud, eriti reaalajas andmeedastus ja nutitelefoni rakendused, samuti uued võimalused sotsiaalmeedias on mõjutanud harrastusteadust, sest uuenduslikumad analüüsimeetodid võimaldavad edukamat andmehaldust, tulemuste visualiseerimist, tõlgendamist, kasutamist ja jagamist. EL COST projekt ’Parem arusaamine võõrliikidest läbi harrastusteaduse’ (Increasing understanding of alien species through citizen science, ALIEN-CSI) tegeleb erinevate teadusvaldkondade vaheliste teemadega, mis seonduvad arendamaks ja rakendamaks harrastusteadust, edendamaks teaduslikku arusaama võõrliikide dünaamikast ning samal ajal osalema seadusandlikus otsustusprotsessis, nagu nt. EL invasiivsete võõrliikide regulatsioonis 1143/2014 sätestatud tingimuste rakendamiseks. Samuti toetavad projekti tegevused EL bioloogilise mitmekesisuse strateegia eesmärke ja aitavad kaasa teaduse rakendamiseks ühiskonnas. Projekt uurib ja talletab võimalusi, et luua üle-Euroopaline võõrliikide harrastusteaduse võrgustik. Projekti tegevused näevad ette asjakohaste uuenduste tegemist andmete kogumises ja aruandluses toetamaks seiremeetmete rakendusi ning tagamaks tulu ühiskonnale ja kodanikele. Projekt seeläbi i) suurendab harrastusteaduse algatuste kvaliteeti ja kaasamist, ii) tagab ja hindab tegevuse hariduslikku väärtust ning iii) suurendab väljundite väärtust kõigile võimalikele kasutajatele, sh. tavakodanikud, teadlased, võõrliikide eest vastutavad ametnikud, poliitikakujundajad, kohalikud omavalitsused, tööstus ja muud huvirühmad.

Suomi (Finnish)

Lisää tietoa vieraslajeista kansalaistieteen avulla (Alien CSI)

Vieraslajien esiintymisen maailmanlaajuisessa yleistymisessä ei näy laantumisen merkkejä ja lisäksi joidenkin lajien leviämisnopeuden on havaittu kasvavan. Kuitenkin näihin lajeihin liittyvien tietojen keräämisen haasteet tunnetaan. Kansalaistieteen viimeaikainen kehitys antaa mahdollisuuden parantaa tulokaslajeihin liittyvän tiedon hankintaa ja näiden lajien tuntemusta, samalla kun sitoutetaan yhteiskuntaa tehokkaasti ja laadukkaasti vieraslajeihin liittyvien kysymysten hoitoon. Teknologian edistyminen, erityisesti online-resurssien ja älypuhelinsovellusten kehittyminen ovat sosiaalisen median ohella mullistaneet kansalaistieteen, lisäten yhteyksiä, samalla kun uusien ja innovatiivisten analyysitekniikoiden ilmaantuminen varmistaa tiedon asianmukaisen hallinnan, visualisoinnin, tulkinnan, käytön ja jakamisen. COST-toimen tutkijoiden yhteistyöverkosto

käsittelee kansalaistieteen kehittämiseen ja toteutukseen liittyviä monitieteellisiä tutkimuskysymyksiä, edistäen tulokaslajien dynamiikan tiedepohjaista ymmärtämistä ja tutkimustiedon käyttöä päätöksenteossa, erityisesti asiaan liittyvän lainsäädännön, kuten EU:n asetuksen N:o 1143/2014 teknisten vaatimusten täytäntöönpanossa. Se tukee myös EU:n luonnon monimuotoisuuden säilyttämiselle asettamia tavoitteita ja tieteen integraatiota yhteiskuntaan. COST-toimi tutkii ja dokumentoi lähestymistapoja Euroopan laajuisen vieraslajien kansalaistieteen verkoston perustamiseksi. Se omaksuu asiaankuuluvat innovaatiot tietojen keräämisessä ja raportoinnissa tukien tarkkailu- ja valvontatoimien täytäntöönpanoaja samalla kun se ajaa yhteiskunnan ja kansalaisten etuja. Toiminta edistää näin ollen osallistumisaktiivisuutta ja sitoutumista meneillään oleviin kansalaistiedealoitteisiin, varmistaen ja arvioiden koulutuksen arvoa, ja parantaen tulosten käyttöarvoa potentiaalisten käyttäjien, kuten kansalaisten, tutkijoiden, vieraslajeista vastaavien toimihenkilöiden, poliittisten päättäjien, paikallisviranomaisten, teollisuuden, ja muiden sidosryhmien kannalta.

Français (French)

Accroître la compréhension des espèces exotiques grâce à la science citoyenne (Alien-CSI)

Il n'y a aucun signe de saturation dans l'accumulation des introductions d'espèces exotiques (EE) dans le monde entier, en outre le taux de propagation de certaines espèces s'est également accru. D’autre part, les difficultés pour collecter des informations sur les EE sont reconnues. Les développements récents en science citoyenne (SC) offrent une opportunité d'améliorer le flux de données et les connaissances sur les EE tout en assurant un engagement sociétal efficace et de haute qualité sur la question des EE envahissantes (EEE). Les avancées technologiques, en particulier l'enregistrement en ligne et les applications pour smartphones, ainsi que le développement des réseaux sociaux, ont révolutionné la SC et augmenté la connectivité, tandis que de nouvelles techniques innovantes d'analyse émergent pour assurer la bonne gestion, la visualisation, l'interprétation et l'utilisation des données. L'action abordera des questions de recherche multidisciplinaires en relation avec le développement et la mise en œuvre des SC, fera progresser la compréhension scientifique de la dynamique des EE tout en aidant à la prise de décision. Ius spécifiquement, l’Action appuiera la mise en œuvre des exigences techniques des législations pertinentes, telles que le Règlement UE 1143/2014 sur les EEE. Il soutiendra également les objectifs de l'UE en matière de biodiversité et l'intégration de la science dans la société. L'action explorera et documentera des approches pour établir un large réseau SC et EE au niveau européen. Il inclura des innovations pertinentes pour la collecte de données et la diffusion, afin de soutenir la mise en œuvre de mesures de suivi et de surveillance, tout en assurant des bénéfices pour la société et les citoyens, à travers un réseau européen de SC pour les EE. L'Action, par conséquent, augmentera les niveaux de participation et la qualité de l’engagement des initiatives actuelles de SC, garantira et évaluera la valeur éducative et améliorera les résultats pour les utilisateurs potentiels: citoyens, scientifiques, gestionnaires d'espèces exotiques, décideurs politiques, autorités locales, industrie et autres parties prenantes.

Deutsch (German)

Kapazitätenentwicklung für gebietsfremde Arten durch Citizen Science (Alien-CSI)

Es gibt keine Anzeichen für eine mögliche Stagnation im Auftreten von gebietsfremden Arten (GA) weltweit. Es wurde sogar gezeigt, dass die Ausbreitungsrate für einige Arten zunimmt. Allerdings wurden die Herausforderungen in der Informationsbeschaffung über GA erkannt. Jüngste Entwicklungen im Bereich Citizen Science (CS) bieten eine Gelegenheit, den Datenfluss und das Wissen über GA zu verbessern. Zudem gewährleisten sie eine effektive und qualitativ hochwertige gesellschaftliche Auseinandersetzung mit dem Thema invasive gebietsfremde Arten (IGA). Technologische Fortschritte, insbesondere bei Online-Aufzeichnungen und mobilen Anwendungen (Apps), sowie die Entwicklung von sozialen Medien, haben CS revolutioniert und die Konnektivität erhöht. Gleichzeitig gewährleisten neue und innovative Analysetechniken eine angemessene Verwaltung, Visualisierung, Interpretation und gemeinsame Nutzung der gesammelten Daten. Das neue COST-Progamm „Kapazitätenentwicklung für gebietsfremde Arten durch Citizen Science“ (original Titiel „Increasing understanding of alien species through citizen science“) befasst sich mit interdisziplinären Forschungsfragen in Bezug auf (1) die Entwicklung und Umsetzung von CS, (2) die Weiterentwicklung des wissenschaftlichen Verständnisses der GA-Dynamiken, und (3) die Entscheidungsfindung zur spezifischen Umsetzung der technischen Anforderungen relevanter Rechtsvorschriften, wie etwa der EU-Verordnung 1143/2014 zu IGA. Sie wird auch die Biodiversitätsziele der EU unterstützen und helfen, die Wissenschaft besser in die Gesellschaft einzubetten. Das COST Programm wird Ansätze zur Einrichtung eines europaweiten CS-GA-Netzwerkes entwickeln und dokumentieren. Ein solches europäisches Netzwerk schafft die Voraussetzungen um relevante Innovationen für die Datenerhebung und Berichterstattung in Überwachungsmaßnahmen einfließen zu lassen. Darüber hinaus gewährleistet es auch Vorteile für die Gesellschaft und die Bürger. Das COST-Programm wird somit (1) die Beteiligung und die Einbeziehung aktueller CS-Initiativen erhöhen, (2) den Bildungswert sicherstellen und bewerten, und (3) die Ergebnisse für potenzielle Nutzer (einschließlich Bürger, Wissenschaftler, Naturschutz- und Grünflächenmanager, politische Entscheidungsträger, lokale Behörden, Industrie, und andere Interessengruppen) verbessern.

Ελληνικά (Greek)

Συμβολή των πολιτών-επιστημόνων στην αντιμετώπιση της πρόκλησης των ξενικών ειδών (Alien-CSI)

Δεν υπάρχουν ενδείξεις ότι οι εισαγωγές ξενικών ειδών (ΞΕ) παγκοσμίως έχουν κορεστεί, αντίθετα μάλιστα ο ρυθμός εξάπλωσης για ορισμένα είδη αυξάνεται. Η συλλογή πληροφορίας σχετική με τα ΞΕ αποτελεί μια πρόκληση. Οι πρόσφατες εξελίξεις στο πεδίο των πολιτών-επιστημόνων (ΠΕ) παρέχουν τη δυνατότητα για εμπλούτιση και βελτίωση της ροής πληροφοριών σχετικών με τα ΞΕ, εξασφαλίζοντας ταυτόχρονα μια αποτελεσματική και υψηλής

ποιότητας ενασχόληση της ευρύτερης κοινωνίας στο θέμα των χωροκατακτητικών ξενικών ειδών (ΧΞΕ). Οι τεχνολογικές εξελίξεις, ιδιαίτερα δε η διαδικτυακή καταγραφή ΞΕ και οι εφαρμογές κινητών τηλεφώνων (smartphone apps), μαζί με την ανάπτυξη των κοινωνικών δικτύων έχουν φέρει επανάσταση σε δράσεις ΠΕ. Συγχρόνως, καινοτόμες τεχνικές ανάλυσης δεδομένων εξασφαλίζουν καταλληλότερη διαχείριση, οπτικοποίηση, ερμηνεία και ανταλλαγή της πληροφορίας. Η παρούσα Δράση COST διερευνά διεπιστημονικά ερωτήματα σχετικά με την περαιτέρω ανάπτυξη της επιστήμης των ΠΕ και την επιστημονική κατανόηση της δυναμικής των ΞΕ, ενώ παράλληλα μπορεί να στηρίξει την εφαρμογή σχετικής νομοθεσίας, όπως ο Κανονισμός 1143/2014 της ΕΕ για τα ΧΞΕ. Η Δράση θα συμβάλλει επίσης στους στόχους της ΕΕ για τη βιοποικιλότητα και τη διάχυση/ενσωμάτωση της επιστήμης στην κοινωνία. Επίσης, θα διερευνήσει προσεγγίσεις για τη δημιουργία ενός πανευρωπαϊκού δικτύου ΠΕ αναφορικά με τα ΞΕ. Θα συμπεριλάβει σχετικές καινοτομίες για τη συλλογή δεδομένων και την υποβολή εκθέσεων για την εφαρμογή μέτρων παρακολούθησης και εποπτείας, εξασφαλίζοντας ταυτόχρονα οφέλη για την κοινωνία και τους πολίτες. Συνεπώς, η Δράση θα ενισχύσει και θα αυξήσει τα επίπεδα συμμετοχής σε υπάρχουσες δράσεις ΠΕ, θα αξιολογήσει την εκπαιδευτική αξία τους, και θα βελτιώσει την κατάλληλη χρήση των αποτελεσμάτων τους για τους πιθανούς χρήστες, συμπεριλαμβανομένων των πολιτών, επιστημόνων, φορέων διαχείρισης ΞΕ, υπεύθυνων πολιτικών αποφάσεων, τοπικών αρχών, της βιομηχανίας και άλλων ενδιαφερομένων.

עברית (Hebrew)

שימוש במדע אזרחי להרחבת הידע בתחום מינים פולשים (Alien-CSI)

נכון להיום, אין שום רמז לדעיכה בעוצמת ההתפשטות וקצב ההופעה של מינים פולשים ברחבי העולם. יחד עם זאת, ישנם קשיים שונים ביכולות איסוף המידע הרלוונטי לאותם מינים פולשים. התפתחויות אחרונות בתחום ה'מדע האזרחי' מספקות הזדמנות לשפר את זרימת המידע והידע בנוגע למינים פולשים תוך כדי הבטחה של שילוב יעיל ואיכותי של הציבור בנושא חשוב זה. פיתוחים טכנולוגיים כגון אפליקציות סלולריות, יכולות תיעוד בזמן אמת, ביחד עם התפתחות הרשתות החברתיות גרמו למהפכה בתחום המדע האזרחי. בנוסף, טכניקות ניתוח נתונים חדשניות מפותחות חדשות לבקרים, במטרה להבטיח שימוש נכון בניהול הנתונים, בפרשנותם, בהצגתם ושיתופם. שיתוף פעולה זה ידון בשאלות מחקר רב-תחומיות בנוגע לפיתוח ויישום של מדע אזרחי וקידום ההבנה המדעית של דינמיקת הפלישות הביולוגיות, יחד עם הכוונת מקבלי ההחלטות לגבי הצרכים הטכניים לחקיקות בתחום, כגון רגולציה מס' 1143/2014 של האיחוד האירופי בנוגע למינים פולשים. בנוסף, המחקר יתמוך ב'מטרות המגוון הביולוגי' של האו"ם והטמעת המדע בקרב החברה. המחקר יעסוק ויבחן גישות שונות להקמת רשת אירופאית של 'מדע אזרחי עבור מינים פולשים', אשר תאמץ שיטות חדשניות לאיסוף מידע ולדיווח, לטובת ולרווחת הציבור והחברה. מחקר זה ישפר את הכמות והאיכות של השתתפות הציבור ביוזמות עכשוויות של 'מדע אזרחי', תוך כדי הבטחה לתרומה חינוכית ושיפור התועלות היישומיות לצרכנים פוטנציאליים, כולל הציבור הרחב, מדענים, מנהלי שטח וממשק מינים פולשים, מקבלי ההחלטות, רשויות מקומיות, תעשייה ובעלי עניין אחרים.

Magyar (Hungarian)

Az idegenhonos fajokkal kapcsolatos ismeretek bővítése a „polgári tudomány” (citizen science) bevonásával (Alien-CSI)

Az idegenhonos élő szervezetek behurcolása és egyes fajok rohamos terjedése világszerte egyre nagyobb problémát jelent. A „polgári tudomány” (citizen science) bevonásával történő adatgyűjtés sok szempontból nem egyszerű feladat, azonban a társadalom szélesebb rétegeinek mozgósítása lehetőséget teremt az idegenhonos, illetve inváziós fajokkal kapcsolatos hatékonyabb információátadásra és a tudományos alapokon nyugvó ismeretek megosztására és bővítésére. A technikai fejlődés, különösen az online adatrögzítés és az okostelefonos alkalmazások, valamint a közösségi média térhódítása forradalmasították a „polgári tudományt”. Az újabb, innovatív elemzési módszerek révén pedig könnyebbé válik az adatok megfelelő kezelése, megjelenítése, értelmezése, felhasználása és megosztása. A CA17122 COST akció a közösségi tudomány fejlődését és mindennapi gyakorlatát elősegítő, egyúttal az idegenhonos fajok biológiájának megértését célzó multidiszciplináris kutatási kérdésekkel foglalkozik. Tudományos szemléletével és gyakorlatával hozzájárul a vonatkozó előírások (például az Európai Parlament és a Tanács 1143/2014/EU rendelete az idegenhonos inváziós fajok betelepítésének vagy behurcolásának és terjedésének megelőzéséről és kezeléséről) teljesítéséhez, az EU biológiai sokféleség megőrzésével kapcsolatos céljainak eléréséhez, továbbá növeli a tudomány társadalomba ágyazottságát. A COST akció további célja, hogy feltárja és dokumentálja azokat a módszereket, melyek együttesen hozzájárulhatnak egy európai szintű, a közösség érdekeit is kiszolgáló és a „polgári tudományt” felhasználva az idegenhonos fajok vizsgálatát segítő hálózat létrehozásához az adatgyűjtés és adatszemléltetés korszerű eszköztárának bevonásával. A program megvalósításával fokozódhat a társadalmi részvétel és a hasonló kezdeményezésekkel történő kooperáció, valamint az ismeretátadás mértéke. Mindez elősegíti a potenciális felhasználók – köztük a csatlakozó állampolgárok, a kutatók, a politikai döntéshozók, az illetékes szakhatóság, az ipar és más érdekelt felek – harmonikus és hatékony együttműködését a minőségi ismeretbővítés és döntéshozatal érdekében.

Íslensku (Icelandic)

Þekking á ágengum tegundum efld með almenningsvísindum (citizen science)

Ágengum tegundum fer ört fjölgandi víða um heim, auk þess sem útbreiðsla þeirra eykst með stigmagnandi hraða. Erfitt getur reynst að safna upplýsingum um þessar tegundir. Aukin þátttaka almennings í gagnasöfnun, svokölluð almenningsvísindi (citizen science) hafa veitt tækifæri til að bæta þekkingu og gæði upplýsinga, samhliða því sem vitund almennings um málefnið eykst. Tæknilegar framfarir, einkum notkun vefgátta og snjallsíma við skráningar, ásamt mikilvægi samfélagsmiðla, hafa gjörbreytt möguleikum til að virkja almenning. Þá hafa aðferðir við samantekt, greiningu og úrvinnslu gagna einnig tekið framförum. Aðgerðin sem hér er kynnt mun samþætta þverfaglegar rannsóknir varðandi þróun og innleiðingu almenningsvísinda, auka þekkingu á ágengum tegundum víða í

Evrópu og styrkja ákvarðanatöku er tengist innleiðingu Reglugerð Evrópusambandsins nr. 1143/2014 er varðar framandi, ágengar tegundir. Einnig styður aðgerðin markmið Evrópusambandsins um líffræðilega fjölbreytni og samfélagsleg mikilvægi vísinda. Aðgerðin mun rannsaka og útfæra leiðir við að stofna sérstakan almenningsvísindagagnagrunn fyrir Evrópu sem fjallar um ágengar tegundir. Notaðar verða nýjungar í gagnasöfnun og –miðlun til að styrkja innleiðingu og framkvæmd vöktunarverkefna, og áhersla verður lögð á gagnsemi og fræðslugildi fyrir almenning, vísindasamfélög, stjórnvöld og ekki síst aðila sem stýra aðgerðum til að stemma stigu við ágengum tegundum.

Italiano (Italian)

Accrescere la conoscenza delle specie aliene attraverso la citizen science

Le nuove introduzioni di specie aliene (SA) nei diversi continenti non mostrano di aver raggiunto un livello di saturazione. Inoltre, è stato dimostrato che il tasso di diffusione per alcune specie è in aumento. Tuttavia, esistono delle difficoltà nella raccolta di informazioni aggiornate sulla diffusione di SA. I recenti sviluppi nella Citizen Science (CS), o scienza partecipativa, offrono l'opportunità di migliorare il flusso di dati e le conoscenze sulle SA, garantendo al tempo stesso un coinvolgimento dei cittadini efficace sul tema delle specie aliene invasive (SAI). I progressi tecnologici, in particolare la possibilità di segnalazioni on-line e le applicazioni mobili per smartphone (app), nonché lo sviluppo dei social media, hanno rivoluzionato la CS ed aumentato la connettività. Allo stesso tempo, nuove ed innovative tecniche di analisi assicurano la corretta gestione, visualizzazione, interpretazione, utilizzo e condivisione dei dati. La nuova COST Action “Accrescere la conoscenza delle specie aliene attraverso la citizen science”, sviluppera’ temi di ricerca multidisciplinare relativi allo sviluppo e all'attuazione della CS, per migliorare la comprensione scientifica delle dinamiche delle SA e per dare supporto ai processi decisionali, in particolare sull'attuazione dei requisiti tecnici di legislazioni pertinenti , come il regolamento UE n. 1143/2014 sulle SAI. Inoltre, sosterrà gli obiettivi di tutela della biodiversità stabiliti dall’UE , e contribuirà ad integrare la scienza nella società. L'Action esplorerà e documenterà approcci per la creazione di una rete di CS Europea dedicata alle SA. Tale rete creerà ’ i prerequisiti per l’integrazione di importanti innovazioni per la raccolta e la segnalazione di dati a sostegno dell'attuazione di misure di monitoraggio e sorveglianza, garantendo nel contempo benefici per la società e i cittadini. La COST Action contribuira’ ad aumentare il livello di partecipazione e coinvolgimento dei cittadini nella CS, garantendo il valore educativo e migliorando i risultati per i potenziali utenti, compresi i cittadini, scienziati, responsabili della gestione di specie aliene, politici e autorità locali, i settori professioalmente interessati o coinvolti.

Lietuvių kalba (Lithuanian)

Suvokimo apie svetimas rūšis didinimas per piliečių mokslą (ALIEN-CSI)

Pasaulyje nemažėja svetimų rūšių (SR) introdukcijų mastas, be to, kai kurių rūšių plitimas intensyvėja. Tuo pačiu susiduriama su iššūkiais renkant informaciją apie SR. Pastaraisiais metais besivystantis piliečių mokslas (PM) suteikia galimybių pagerinti duomenų gavimą bei pagilinti žinias apie SR ir tuo pačiu užtikrinti efektyvų ir kokybišką visuomenės įjungimą sprendžiant invazinių SR (ISR) problemas. Technologiniai pasiekimai, ypač duomenų registravimas online, išmaniųjų telefonų programėlės bei socialinių tinklų plėtotė revoliucionizavo PM ir pagerino apsikeitimą žiniomis. Be to, atsirandančios naujos ir inovatyvios analitinės technologijos leidžia užtikrinti tinkamą duomenų apdorojimą, vizualizaciją, interpretaciją, naudojimą ir sklaidą. COST veikla „Suvokimo apie svetimas rūšis didinimas per piliečių mokslą (ALIEN-CSI)“ apims multidisciplininius mokslinius klausimus susijusius su PM vystymu ir įgyvendinimu, užtikrins pažangias mokslines žinias apie SR dinamiką, mokslo žiniomis pagrįstą platformą sprendimų priėmimui ir technines galimybes vykdyti atitinkamus įstatymus, tokius kaip ES reglamentas Nr. 1143/2014 dėl ISR. Veikla taip pat prisidės prie ES biologinės įvairovės išsaugojimo tikslų ir skatins visuomenę dalyvauti ir suprasti mokslinį darbą. COST veikla ALIEN-CSI rinks duomenis ir fiksuos būdus, kaip sukurti vieningą europinį PM SR tinklą. Veikloje planuojama pasinaudoti inovacijomis tinkamomis duomenų rinkimui ir tvarkymui tam kad pagerinti SR monitoringo ir priežiūros priemones, o tuo pačiu per europinį PM SR tinklą užtikrinti naudą visuomenei ir piliečiams. Tuo būdu ši COST veikla padidins jau egzistuojančių PM iniciatyvų efektyvumą ir kokybę, užtikrins ir įvertins edukacinę jų kokybę bei padidins gaunamų rezultatų vertę potencialiems vartotojams, tame tarpe piliečiams, mokslininkams, ekologams, užsiimantiems SR valdymu, politikams, vietos valdžiai, pramonei ir kitoms suinteresuotoms šalims.

Lëtzebuergesch (Luxembourgish)

Verbesserung vum Versteesdemech vu gebittsfriemen Aarten duerch Biergerfuerschung (Alien-CSI)

Et gi keng Unzeeche fir eng Saturatioun bei der Aféierung vu gebittsfriemen Aarten (Alien Species = AS) weltwäit, zousätzlech huet sech gewisen, datt den Ausbreedungstaux bei munch Aarten zougeholl huet. Et ass ee sech vun den Defie vun der Informatiounsbeschafung iwwert AS bewosst. Rezent Entwécklungen an der Biergerfuerschung (Citizen science = CS) erméigleche Verbesserunge beim Floss vun Donnéeën a beim Wëssen iwwert AS, a suerge gläichzäiteg fir en effikassen a qualitativ héichwäertegen Engagement vun der Gesellschaft punkto invasiv gebittsfriem Aarten (Invasive Alien Species = IAS). Fortschrëtter an den Technologien, besonnesch wat Online-Erfaassung a Smartphone-Applikatiounen ubelaangt, an d'Entwécklung vun de soziale Medien hunn CS revolutionéiert an d'Connectivitéit verbessert, iwwerdeems nei an innovativ Analystechniken entstinn, déi fir eng adequat Verwaltung, Visualiséierung, Interpretatioun, Notzung an Austausch vun Donnéeë suergen. Dës COST-Aktioun wäert

sech mat multidisziplinäre Fuerschungsfroe befaassen am Kontext vun der Entwécklung an der Ëmsetzung vu CS, dat wëssenschaftlecht Versteesdemech fir d'Dynamik vun AS fërderen a gläichzäiteg den Entscheedungsprozess ënnerstëtzen am Kader vun der spezifescher Ëmsetzung vun den techneschen Ufuerderunge vu relevante legislativen Texter wéi beispillsweis der EU-Veruerdnung 1143/2014 zu den IAS. D'Aktioun wäert d'Biodiversitéitsziler vun der EU ënnerstëtzen an dozou bäidroen, d'Wëssenschaft besser an der Gesellschaft ze verankeren. Am Kader vun dëser Aktioun ginn Usätz fir den Opbau vun engem europawäite CS-AS-Netzwierk ënnersicht an dokumentéiert. Si wäert relevant Innovatioune fir d'Erfaasse vun Donnéeën an d'Verfaasse vu Rapporten ëmfaassen, fir d'Ëmsetzung vun Iwwerwaachungs- a Kontrollmechanismen ze ënnerstëtzen a gläichzäiteg den Notze fir d'Gesellschaft an d'Bierger duerch en europäescht CS-Netzwierk ze garantéieren. D'Aktioun wäert dowéinst d'Participatioun an d'Qualitéit vun der Participatioun un de lafende CS-Initiativen erhéijen, de Bildungswäert sécherstellen an evaluéieren, an d'Resultater fir potentiell Utilisateure wéi Bierger, Wëssenschaftler, Gestionnaire vun AS, politesch Instanzen, lokal Autoritéiten, Industrie an aner concernéiert Acteuren.

Македонски (Macedonian)

Не само што нема знаци на заситеност во интродукцијата на адвентивни видови (АВ) насекаде во светот туку се воспоставува дека интензитетот на ширењето на некои видови е во пораст. Сепак, предизвикот за собирање на информации за АВ е препознаен. Развојот на граѓанската наука (ГН) во поново време создава можности за подобрување на протокот на податоци и сознанија за АВ осигурувајќи ефективен и квалитетн социјален ангажман во проблемот на инвазивните АВ (ИАВ). Технолошкиот напредок, особено on-line снимањата и апликациите за паметните телефони, заедно со развојот на социјалните медиуми, ја револуционизираа ГН и зголемија поврзаноста, со појава на нови и иновативни аналитички техники за обезбедување на соодветен менаџмент, визуелизација, интерпретација, употреба и споделување на податоци. Акцијата ќе се насочи кон мултидисциплинарни истржачувачки прашања поврзани со развојот и имплементирањето на ГН, унапредувањето на научното разбирање на динамиките на АВ со информирање за техничките потреби за релевантна легислатива како ЕУ Регулативата 1143/2014 за ИАВ. Тоа ќе ги подржи интенциите на ЕУ во врска со зачувување на биодиверзитетот и вградувањето на науката во општеството. Таа ќе ги истражува и документира пристапите за основање на Европска ГН АВ мрежа и ќе опфати релевантни иновации за собирање на податоци и известувања за подршка на имплементацијата на мерките за мониторинг и надзор при што преку една таква мрежа ќе се осигураат придобивки за општеството и граѓаните. Според тоа, акцијата ќе го зголеми учеството и квалитетот на ангажманот со тековните ГН иницијативи, обезбедувајќи и оценувајќи ја образовната вредност и унапредување на вредноста на исходите за потенцијалните корисници како граѓаните, научниците, менаџерите со адвентивните воидови, креаторите на политиката, локалниата власт, индустријата и другите засегнати страни.

Malti (Maltese)

Żieda fil-fehim ta’ speċi aljeni permezz tax-xjenza taċ-ċittadini (Alien-CSI)

Ma hemm l-ebda sinjal ta’ waqfien fir-rata ta' introduzzjonijiet ta’ speċi aljeni (AS) madwar id-dinja; anzi, intwera’ ukoll li din ir-rata ta' tixrid għal xi speċi qieghda tiżdied. Madankollu, l-isfidi ghall-ġbir ta’ informazzjoni dwar AS huma maghrufa sew. Żviluppi reċenti fix-xjenza taċ-ċittadin (CS) jipprovdu opportunità biex intejbu il-ġbir ta’ l-informazzjoni u l-għarfien dwar AS waqt li jiżguraw involviment effettiv tas-soċjetà f’dan l-istess ġbir. L-avvanzi fit-teknoloġija, partikolarment fir-reġistrazzjoni onlajn u fl-‘apps’ ta’ l-‘ismartphone’, flimkien mal-iżvilupp tal-‘media’ soċjali, irrevoluzzjonaw is-CS u l-konnettività miżjuda filwaqt li qeghdin jitfaċċaw teknologiji ġodda u innovattivi ta’ l-analiżi ta’ l-informazzjoni, biex jiżguraw ġestjoni, viżwalizzazzjoni, interpretazzjoni, użu u qsim tad-‘data’ xieraq. Din l-Azzjoni se tindirizza kwistjonijiet ta’ riċerka multidixxiplinari fir-rigward tal-iżvilupp u l-implimentazzjoni tas-CS, se tippova tavvanza l-għarfien xjentifiku fuq id-dinamika tad-tifriex ta’ l-AS, filwaqt li tinforma t-teħid tad-deċiżjonijiet, speċifikament l-implimentazzjoni tal-leġiżlazzjoni rilevanti, bħar-Regolament tal-UE 1143/2014 dwar l-IAS. Ser tappoġġja wkoll l-għanijiet ta’ l-Unjoni Ewropeja dwar il-bijodiversità u li jinkorpora x-xjenza fis-soċjetà. L-Azzjoni se tesplora u tiddokumenta l-metodi differenti madwar l-Ewropa għall-istabbiliment ta’ netwerk fuq CS AS. Se tħaddan innovazzjonijiet rilevanti għall-ġbir u r-rappurtar tad-‘data’ biex tappoġġja l-implimentazzjoni ta’ miżuri ta' monitoraġġ u sorveljanza, filwaqt li tiżgura benefiċċji għas-soċjetà u ċ-ċittadini, permezz ta' netwerk Ewropew fuq CS AS. L-Azzjoni għandha, għalhekk, iżżid il-livelli ta’ parteċipazzjoni u L-livelli ta' impenn u collaborazzjoni ma’ inizjattivi attwali oħra tas-CS, barra li tiżgura u tevalwa l-valur edukattiv u ttejjeb ir-riżultati għal utenti potenzjali, inklużi ċittadini, xjentisti, u partijiet interessati oħra.

Crnogorski (Montenegrin)

Povećanje razumijevanja o stranim vrstama kroz concept “citizen science” (Alien-CSI)

Još uvijek ne postoje dokazi da je u svijetu došlo do zasićenja kad je riječ o introdukciji stranih vrsta (alien species - AS), naprotiv dokazano je za neke vrste da im se brzina širenja povećava. Izazovi u prikupljanja informacija o invazivnim vrstama dobijaju sve više na značaju i prepoznaju se na globalnom nivou. Skoriji napredak u „citizen science” (CS) pružio je priliku za poboljša razmjena podataka i znanje o stranim vrstama, u isto vrijeme osiguravajući uspješan i kvalitetan društveni angažman kad je riječ o invazivnim stranim vrstama (invasive alien species - IAS). Napredak u tehnologiji, posebno on-line snimanje i aplikacije za smartphone, zajedno s razvojem društvenih medija, doveo je do prave revolucije u korišćenju CS i uticao na veću povezanost, uporedo sa razvojem novih i inovativnih analitičkih tehnika koje imaju za cilj da se obezbijedi odgovarajuće upravljanje, vizualizacija, tumačenje, korišćenje i dijeljenje podataka. Akcija će se baviti multidisciplinarnim istraživačkim pitanjima u vezi sa razvojem i implementacijom CS koncepta, unaprijeđivanjem naučnog razumijevanja dinamike introdukcije stranih vrsta, informisanjem nadležnih institucija koje se bave odlučivanjem u ovoj oblasti konkretno o

implementaciji tehničkih zahtjeva relevantnih zakona kao što je Uredba EU 1143/2014 o IAS. Akcija će podržati ciljeve EU-a kad je riječ o biodiverzitetu sa ciljem što većeg uključivanja nauke u društvo. Akcija će istražiti i dokumentovati različite pristupe u uspostavljanju evropske CS AS mreže. Akcija će uključiti relevantne inovacije za prikupljanje podataka i izvještavanje kako bi podržala implementaciju odgovarajućeg monitoringa i mjera nadzora, a sve sa ciljem da se obezbijedi korist za društvo i građane, kroz jednu AS CS Evropsku mrežu. Akcija će uticati na povećanje nivoa učestvovanja i kvaliteta angažmana sa aktualnim CS inicijativama, obezbeđujući i stimulišući edukativne vrijednosti, te uticati da rezultat akcije bude koristan i upotrebljiv za sve potencijalne korisnike, uključujući građane, naučnike, menadžere u oblasti upravljanja stranim vrstama, kreatore politike, lokalne vlasti, industriju i druge učesnike.

Polski (Polish)

Zwiększenie poziomu wiedzy o gatunkach obcych i zrozumienia ich znaczenia poprzez naukę obywatelską

Pomimo rosnącej akumulacji gatunków obcego pochodzenia (*alien species* AS) oraz wobec rozprzestrzeniania się niektórych z nich, do tej pory, w skali globalnej, nie stwierdzono oznak wysycenia biocenoz tymi organizmami. Działania na rzecz zbierania informacji o gatunkach obcego pochodzenia są coraz bardziej doceniane. W czasie realizacji projektów prowadzonych w ramach nauki obywatelskiej (*citizen science* CS) uzyskano bardzo dobre efekty w tej dziedzinie. Dzięki ogromnemu zaangażowaniu społeczeństwa, najnowsze osiągnięcia z zakresu nauki obywatelskiej, zapewniają zwiększenie efektywności przepływu danych i wiedzy na temat gatunków obcego pochodzenia. Obecny postęp technologiczny, a szczególnie aplikacje na smartfony, możliwość przekazywania treści w trybie on-line oraz rozwój mediów społecznościowych, zrewolucjonizowały naukę obywatelską i zwiększyły łączność pomiędzy społeczeństwem a naukowcami zajmującymi się tymi zagadnieniami. Skróciło to znacząco czas potrzebny na przekazanie danych. Wszystkie te innowacyjne rozwiązania wymagają jednak zapewnienia odpowiedniego, profesjonalnego zarządzania, wizualizacji, interpretacji oraz wykorzystania i udostępniania zebranych danych. Akcja COST wychodzi naprzeciw nowym wyzwaniom związanym z poszukiwaniem rozwiązań interdyscyplinarnych problemów badawczych wiążących się z gatunkami obcego pochodzenia w odniesieniu do postępującego rozwoju i prowadzonych wdrożeń z zakresu nauki obywatelskiej. Celem projektu jest zwiększenie zrozumienia podstaw naukowych dynamiki gatunków obcego pochodzenia, przy jednoczesnym informowaniu o podejmowanych decyzjach, a w szczególności wdrożenie odpowiednich wymagań technicznych regulowanych przez ustawodawstwo takie jak rozporządzenie UE 1143/2014 w sprawie gatunków inwazyjnych (*invasive alien species* IAS). Uczestnicy Akcji COST będą wspierać działania UE w zakresie różnorodności biologicznej i rozwoju nauki społecznej. W ramach Akcji zostaną przeanalizowane i udokumentowane wszelkie rozwiązania mające na celu utworzenie ogólnoeuropejskiej sieci „Nauka Obywatelska a Gatunki Obcego Pochodzenia" (CS AS). Akcja będzie obejmować istotne innowacje w zakresie gromadzenia danych i raportowania ich w celu wdrażania systemu śledzenia i nadzoru środków, jednocześnie zapewniając korzyści

społeczeństwu i obywatelom za pośrednictwem sieci europejskiej „Nauka Obywatelska a Gatunki Obcego Pochodzenia" (CS AS). Działania COST mają na celu zwiększenie udziału i poziomu zaangażowania społeczeństwa w bieżące inicjatywy z zakresu nauki obywatelskiej (CS), prowadzenie działań edukacyjnych oraz przekazanie rezultatów akcji potencjalnym użytkownikom, w tym: obywatelom, naukowcom, użytkownikom, hodowcom gatunków obcego pochodzenia, decydentom politycznym, przedstawicielom władzy lokalnej, przemysłu i innych grup społecznych.

Português (Portuguese)

A ciência-cidadã como instrumento para a melhoria do conhecimento sobre espécies exóticas (Alien-CSI)

O número de espécies exóticas (EE) a nível global parece não ter ainda atingido um nível de saturação, tendo inclusive a propagação de algumas espécies vindo a aumentar. Há uma necessidade crescente de compreender e documentar melhor a introduções de espécies exóticas, mas os desafios para tal são muitos. Desenvolvimentos recentes na ciência-cidadã (CC) proporcionam uma oportunidade para melhorar o fluxo de dados e o conhecimento sobre as EE e, ao mesmo tempo, permitem um maior envolvimento social com a questão das espécies exóticas invasoras (EEI). Os avanços tecnológicos, em particular a gravação on-line e as aplicações para smartphones, conjuntamente com as plataformas sociais, revolucionaram o alcance da CC, aumentado a conectividade. Adicionalmente, continuam a ser desenvolvidas técnicas novas e inovadoras de análise de dados, permitindo a visualização, gestão, interpretação e partilha adequada de dados gerados. A presente Ação COST irá abordar questões de investigação multidisciplinar relacionadas com a implementação e desenvolvimento da CC, promovendo a compreensão científica da dinâmica das EE. Permitirá ainda apoiar a tomada de decisões, nomeadamente na implementação técnica da legislação relevante, como o Regulamento (UE) nº 1143/2014 sobre EEI, assim como os objectivos da UE em matéria de biodiversidade e a integração de questões científicas na sociedade. A Ação irá explorar e documentar abordagens possíveis para o estabelecimento de uma rede de CC-EE à escala europeia. Adicionalmente irá adotar inovações relevantes para a obtenção e reporte de dados, permitindo o apoio na implementação de medidas de monitorização e vigilância, garantindo benefícios para os cidadãos e para a sociedade de uma maneira geral. Desta forma, esta Ação contribuirá para o aumento dos níveis de participação e envolvimento das iniciativas de CC existentes, assegurando e avaliando o seu valor educativo, e melhorando a qualidade dos resultados para uso de diferentes agentes, como sejam cidadãos, investigadores, gestores que lidem com EE, decisores políticos, autoridades locais, indústria e outras partes interessadas.

Română (Romanian)

Creșterea cunoștințelor despre specii străine prin cercetare participativă (Alien-CSI)

La nivel global rata de acumulare a speciilor străine nu a încetinit iar viteza de răspândire a unora este tot mai accelerată. Astfel, colectarea informațiilor privind speciile străine constituie o provocare pentru societate. Dezvoltarea recentă a implicării cetățenilor (cercetare participativă sau citizen science) constituie o oportunitate pentru a îmbunătăți fluxul de date și cunoștințe despre speciile străine, contribuind în același timp la o implicare efectivă a societății în problema speciilor străine invazive. Dezvoltarea tehnologică, în particular dezvoltarea aplicațiilor de înregistrare, smartphone și social media au stimulat implicarea cetățenilor și au crescut relaționarea dintre utilizatori, concomitent cu apariția de tehnici inovative de analiză a datelor. Astfel, în prezent se poate asigura un management oportun, se pot vizualiza, utiliza și distribui volume mari de date. Prezenta acțiune COST va răspunde la întrebări de cercetare multidisciplinară relaționate cu dezvoltarea și implementarea citizen science, contribuind la înțelegerea dinamicii speciilor străine concomitent cu informarea factorilor de decizie, cu precădere la implementarea legislației cum ar fi Regulamentul UE 1143/2014 privind prevenirea și gestionarea introducerii și răspândirii speciilor străine invazive. Acțiunea va explora și documenta oportunitatea şi căile pentru stabilirea unei rețele Europene de citizen science în domeniul speciilor străine. Va îngloba inovații relevante din domeniul culegerii datelor și raportărilor necesare implementării măsurilor de monitorizare și supraveghere a speciilor străine, asigurând totodată beneficii societății în ansamblu prin rețeaua Europeană de citizen science în domeniul speciilor străine. Acțiunea COST va contribui astfel la creșterea nivelului de participare și la o calitate mai bună a implicării în inițiativele citizen science curente, permiţând evaluarea valorii educaționale și îmbunătățirea rezultatelor pentru o mai bună înțelegere de către utilizatorii potențiali cum ar fi cetățeni, cercetători, manageri ai speciilor străine, politicieni, administraţie locală, industrie și alți actori interesaţi.

Српски (Serbian)

Боље разумевање страних врста кроз укључивање грађана у истраживања (Alien-SCI)

Широм света нема знакова могућег смањења уношења страних врста (СВ). Чак се повећава брзина ширења неких врста. Препознати су изазови у прикупљању података о СВ. Новији напредак у пракси укључивања грађана у истраживања (CS – од енг. ”citizen science”) нуди могућност да се побољша проток података и знања о СВ уз обезбеђивање ефикасног и високо вредног друштвеног ангажовања када је реч о инвазивним страним врстама (ИСВ). Технолошки напредак, посебно on-line евидентирање и апликације на паметним телефонима, заједно са развојем друштвених мрежа, из корена су променили CS и повећали повезаност свих актера. Истовремено се појављују нове и иновативне аналитичке технике и обезбеђују одговарајуће управљање, визуализацију, тумачење, примену и размену прикупљених података. Нова COST акција (енг. COST - сарадња у науци и

технологији) се бави мултидисциплинарним истраживањима, развојем и применом CS, бољим разумевањем динамике CB и информисањем надлежних за доношење одлука. Посебан нагласак је на спровођењу техничких захтева релевантних закона као што је Уредба ЕУ 1143/2014 о ИСВ. Она ће такође да подржи циљеве ЕУ о очувању биодиверзитета и помоћи ће да се наука боље имплементира у друштво. COST програм ће истраживати и документовати приступе организовању мреже CS CB широм Европе. Таква Европска мрежа ће бити корисна за друштво и грађане јер ће прихватањем одговарајућих иновација за прикупљање података, обавештавањем побољшати проток мера праћења и надзора над ширењем CB. COST програм ће да повећа ниво учешћа и квалитет употребљивости постојећих CS иницијатива, кроз обезбеђивање и оцену образовне вредности. Побољшаће употребљивост података за потенцијалне кориснике укључујући грађане, научнике, стручњаке који управљају заштићеним подручјима и зеленим површинама, носиоце политичких одлука, локалне управе, индустрију и друге кориснике.

Slovensky (Slovak)

Občianska veda (Citizen Science) ako nástroj na zvýšenie povedomia o nepôvodných druhov organizmov

Celosvetová akumulácia introdukovaných nepôvodných druhov (ND) nejaví známky saturácie, naviac miera expanzie niektorých druhov sa stále zvyšuje. Týmto sa zber informácií o ND sa stáva stále väčšou výzvou. Súčasný rozvoj občianskej vedy (citizen science - CS) predstavuje príležitosť nielen k nárastu získaných dát, ale aj k nárastu poznatkov o ND efektívnym a zodpovedným zapojením spoločnosti do problematiky ND. Revolúcia v CS je zvýraznená pokrokom v technológiách, najmä v on-line zázname a aplikáciách pre smartfóny v spojení s rozvojom sociálnych médií. Inovatívne analytické techniky vytvárajú priestor pre vhodný manažment, vizualizáciu, interpretáciu, využívanie a zdieľanie týchto údajov. Projekt sa zaoberá multidisciplinárnymi otázkami v súvislosti s vývojo8m a implementáciou CS, pochopením dynamiky ND a zároveň prinášať informácie v rozhodovacích procesoch, a to najmä v implementácii technických požiadaviek relevantnej legislatívy ako je nariadenie EÚ 1143/2014 o prevencii a manažmente introdukcie a šírenia inváznych nepôvodných druhov. Týmto budú podporené ciele EÚ v oblasti biodiverzity a prepojenie vedy so spoločnosťou. Projekt bude skúmať a dokumentovať prístupy k vytvoreniu celoeurópskej siete CS a ND. Bude zahŕňať relevantné inovácie na zhromažďovanie údajov a ich reportovanie s cieľom podporiť vykonávanie monitorovacích a kontrolných opatrení a súčasne prinesie benefity pre spoločnosť a občanov prostredníctvom európskej siete ND a CS. Tento projekt preto zvýši účasť a kvalitu zapojenia sa do súčasných iniciatív CS, zabezpečí a vyhodnotí prínosy vzdelávania a vylepší hodnotové výsledky pre potenciálnych užívateľov vrátane občanov, vedcov, zodpovedných za manažment nepôvodných druhov alebo za tvorbu pravidiel a legislatívy, miestnych orgánov, priemyslu a ďalších zainteresovaných strán.

Slovensko (Slovenian)

Izboljšanje razumevanja tujerodnih vrst s pomočjo ljubiteljske znanosti (Alien-CSI)

V svetu se zaenkrat še ne kažejo znaki nasičenosti s tujerodnimi vrstami. Nasprotno, hitrost širjenja nekaterih vrst se je v zadnjih letih še povečala. Izzivi, s katerimi se srečujemo pri pridobivanju podatkov o tujerodnih rastlinah, so znani. Nedaven napredek v ljubiteljski znanosti (angl. citizen science) prinaša nove možnosti pridobivanja podatkov in znanja o tujerodnih vrstah, hkrati pa predstavlja učinkovito in kakovostno družbeno angažiranje pri reševanju vprašanja invazivnih tujerodnih vrst. Napredek na področju tehnologije, zlasti spletnega beleženja in aplikacij za pametne telefone, ter hkraten razvoj socialnih medijev sta revolucionirala ljubiteljsko znanost in povečala povezanost, sočasno pa se pojavljajo nove možnosti analiziranja, upravljanja, vizualizacije, interpretacije, uporabe in deljenja podatkov. COST Akcija "Izboljšanje razumevanja tujerodnih vrst s pomočjo ljubiteljske znanosti (Alien-CSI)" se bo osredotočala na multidisciplinarna raziskovalna vprašanja v povezavi z razvojem in izvajanjem ljubiteljske znanosti s ciljem povečanja znanstvenega razumevanja dinamike tujerodnih vrst, prevsem z namenom 1) izboljšanega izvajanja tehničnih zahtev ustrezne zakonodaje, kot je Uredba EU 1143/2014 o invazivnih tujerodnih vrstah, 2) podpore EU ciljem biotske raznovrstnosti in 3) vključevanja znanosti v družbo. Akcija bo raziskala in dokumentirala pristope k vzpostavitvi evropske mreže ljubiteljske znanosti tujerodnih vrst. Sprejela bo ustrezne inovacije za zbiranje podatkov in poročanje z namenom podpore pri izvajanju monitoringa in nadzornih ukrepov, hkrati pa zagotovila koristi za družbo in prebivalce preko evropske mreže ljubiteljske znanosti o tujerodnih vrstah. Akcija bo povečala raven sodelovanja in kakovostnega vključevanja prebivalcev v obstoječe pobude ljubiteljske znanosti, s čimer bo zagotovila izobraževalo vrednost ter izboljšala rezultate za potencialne uporabnike, kot so prebivalci, znanstveniki, upravljalci s tujerodnimi vrstami, snovalci politik, lokalne oblasti, industrija in drugi deležniki.

Español (Spanish)

Aumentando el conocimiento de las especies exóticas a través de la ciencia ciudadana (Alien-CSI).

No hay signos de saturación en la acumulación de las introducciones de especies exóticas (EE) a nivel mundial, pero al mismo tiempo, se ha visto que la tasa de propagación de algunas especies va en aumento. Por otro lado, se reconocen las dificultades para recopilar información sobre EE. El reciente desarrollo de ciencia ciudadana (CC) ofrece una oportunidad para mejorar el flujo de datos y el conocimiento sobre EE, asegurando al mismo tiempo un compromiso social efectivo y de alta calidad sobre las especies exóticas invasoras (EEI). Los avances tecnológicos, en particular el registro on-line y las aplicaciones para teléfonos inteligentes, junto con el desarrollo de redes sociales, han revolucionado la CC y ha aumentado la conectividad, mientras están surgiendo técnicas innovadoras de análisis para garantizar una gestión apropiada, visualización, interpretación, uso y el compartir de los datos. La Acción abordará, de una manera

multidisciplinar, cuestiones de investigación en relación con el desarrollo y la implementación de la CC, aumentando la comprensión científica de la dinámica de las EE, al tiempo que informará de la toma de decisiones, específicamente de la implementación de los requisitos técnicos de la normativa relevante, como el Reglamento de la UE 1143/2014 sobre EEI. También apoyará a la Unión Europea (UE) en los objetivos de biodiversidad y la integración de la ciencia en la sociedad. La Acción explorará y registrará los planteamientos para establecer una amplia red de CC y EE en toda Europa. Incluirá las innovaciones relevantes para la recopilación de datos y la comunicación, para así apoyar la implementación de medidas de monitoreo y vigilancia, al tiempo que se garantizarán los beneficios para la sociedad y los ciudadanos a través de una red europea de CC para las EE. La Acción, por lo tanto, aumentará los niveles de participación y calidad del compromiso con las iniciativas actuales de CC, asegurando y evaluando el valor educativo, y mejorando los valiosos resultados para los usuarios potenciales, incluyendo a los ciudadanos, científicos, gerentes de especies exóticas, responsables políticos, autoridades locales, industrias y otras partes interesadas.

Svenska (Swedish)

Ökad förståelse för främmande arter genom medborgarvetenskap (Alien-CSI)

Det finns inga tecken på mättnad när det gäller introducering av främmande arter världen över, dessutom har vissa arters spridningshastighet också visat sig öka. Utmaningarna vid insamling av information om främmande arter är dock kända. Den senaste utvecklingen inom medborgarvetenskap ger möjligheter att förbättra informationsflödet och öka kunskaperna om främmande arter samtidigt som man säkerställer samhällets effektiva och högkvalitativa engagemang i frågor kring introducerade, främmande arter. Teknologiska framsteg, speciellt online-inspelningar och smartphone-appar, tillsammans med utvecklingen av sociala medier har revolutionerat medborgarvetenskapen och ökat samverkan, medan nya och innovativa metoder utvecklas för att säkerställa lämplig hantering, visualisering, tolkning och användning, samt delning av data. Det Europeiska COST Action nätverksprojektet kommer att ta itu med tvärvetenskapliga forskningsfrågor som rör utvecklingen och implementeringen av medborgarvetenskap, främja den vetenskapliga förståelsen av främmande arters dynamik, samt stödja underbygda beslut, specifikt när det gäller införandet av tekniska krav i relevant lagstiftning, såsom EU-förordningen 1143/2014 om främmande arter. Projektet kommer också att stödja EU: s mål för biologisk mångfald och integrering av vetenskap inom samhället. Nätverksprojektet kommer att undersöka och dokumentera tillvägagångssätt för att inrätta ett europeiskt nätverk för medborgarvetenskap och främmande arter. Nätverket kommer att anamma relevanta innovationer inom datainsamling och rapportering för att stödja genomförandet av övervaknings- och tillsynsåtgärder, samtidigt som man säkerställer fördelar för samhället och medborgarna. Aktiviteter kommer att öka deltagandet i och kvalitén på engagemanget i pågående medborgarvetenskapinitiativ, säkerställa och utvärdera utbildningar, samt förbättra värdet på resultaten för potentiella användare såsom medborgare, forskare, handläggare och förvaltare som arbetar med främmande arter, beslutsfattare, lokala myndigheter, industrier, samt andra intressenter.

Türkçe (Turkish)

Vatandaş Bilimi ile Yabancı Türlerin Daha İyi Anlaşılması (Alien-CSI)

Dünya çapında yabancı tür (YT) girişlerinin birikiminde bir doygunluk belirtisi yoktur, ayrıca bazı türlerin yayılış oranlarının arttığı gösterilmiştir. Bununla birlikte, YT ile ilgili bilgi toplama konusundaki zorluklar bilinmektedir. Vatandaşlık bilimindeki (VB) son gelişmeler, YT ile ilgili veri akışını ve bilgi düzeyini artırma imkanı sağlarken; aynı zamanda İstilacı Yabancı Türler (İYT) ile ilgili olarak etkili ve yüksek kaliteli bir toplumsal katılım fırsatı sunmaktadır. Teknolojideki ilerlemeler, özellikle çevrimiçi kayıt gönderme ve akıllı telefon uygulamaları, sosyal medyanın gelişmesiyle birlikte VB'de devrim yapıp bağlantıyı arttırırken; verilerin doğru yönetilmesini, görselleştirilmesini, yorumlanmasını ve kullanılmasını sağlayan yeni ve yenilikçi analiz teknikleri ortaya çıkmaktadır. Bu yeni Bilim ve Teknoloji alanında Avrupa işbirliği (COST) aksiyonu 2018 yılı Temmuz ayı başlarında başlatıldı. Bu aksiyon, VB'nin geliştirilmesi ve uygulanması ile ilgili disiplinler arası araştırma sorularına değinerek YT dinamikleri hakkında bilimsel anlayışı geliştirirken, özellikle de İYT ile ilgili 1143/2014 sayılı AB Yönetmeliği gibi mevcut mevzuatın teknik gerekliliklerinin özel olarak uygulanması hakkında karar vericiyi bilgilendirmektedir. Aynı zamanda AB'nin biyoçeşitlilik hedeflerini destekleyecek ve bilimi toplumda içselleştirecektir. Aksiyon, Avrupa çapında bir VB - YT ağı kurmaya yönelik yaklaşımları geliştirecek ve belgeleyecektir. İzleme ve gözetim tedbirlerinin uygulanmasını destekleme amacıyla verilerin toplanması ve raporlanması için gerekli yenilikleri içerecek, aynı zamanda bir YT - VB Avrupa ağı aracılığıyla topluma ve vatandaşlara fayda sağlayacaktır. Böylece; COST programı mevcut VB girişimleri ile katılım düzeyini ve katılım kalitesini arttıracak, eğitim değerini sağlayacak ve değerlendirecek, vatandaşlar, bilim insanları, yabancı tür yöneticileri, politikacılar, yerel yetkililer ve diğer paydaşlar dahil potansiyel kullanıcılar için sonuçları iyileştirecektir.

The Challenge

Description of the Challenge

The overarching aim of this Action will be to explore and develop the potential of citizen science (CS), the involvement of volunteers within science, in response to Alien Species (AS). Particular attention will be dedicated to Invasive Alien Species (IAS), a term used to define AS that cause harm to biodiversity and ecosystem services, or have a negative impact on the economy or human health. Managing biological invasions depends on accurate, detailed and up-to-date information on occurrences, distribution, pathways and impact of IAS at varying spatial scales across Europe and indeed globally. Effective and efficient prevention, early detection, rapid response and evaluation of the effectiveness of management measures for IAS require such information. There are a number of ways in which this information can be gathered but increasingly CS is seen as essential to ensure the spatial and temporal resolution of data capture, allowing for rapid response and the success of prevention and management programs. In addition, CS can play a significant role in public engagement, improved education and public awareness, and is recognized as fundamental to the attainment of the objectives of AS policies.

Advances in technology, particularly on-line recording and smartphone apps, along with the development of social media, have revolutionized CS (August et al. 2015) and increased connectivity, while new and innovative analysis techniques are emerging to ensure appropriate management, visualization, interpretation, use and sharing of the data (Isaac and Pocock 2015, Isaac et al. 2014). For example, statistical methods have been developed to account for inherent biases within citizen science data and enable wide-ranging ecological questions to be addressed such as enhanced understanding of IAS impacts leading to prioritization and rapid response (Isaac and Pocock 2015). However, despite these developments the European CS AS landscape is fragmented in terms of geographic engagement/projects, suitability and application of available tools, quality of practices, data accessibility/sharing and data uses.

Through this COST Action we propose to:

1. establish a European-wide CS AS network with the goal of fostering collaboration to increase data gathering capacity and exchange of information on AS;
2. increase levels of participation, educational value and relevance of existing CS initiatives to ensure significance of outcomes (including AS education and action) for all stakeholders (i.e. citizens, scientists, alien species managers, policy-makers, local authorities, industry, schools and other stakeholders);
3. develop methods to improve the CS data quality and appropriate methods of visualization to engage and communicate with all interested stakeholders;
4. analyse the data to improve the understanding of biological invasions while improving implementation of relevant measures to address the challenges and threats to biodiversity, society (including food security and health risks), and economies posed by IAS, and
5. ensure communication and dissemination of results providing evidence to stakeholders engaged in the implementation of the EU Regulation on IAS (1143/2014), particularly in relation to monitoring and surveillance schemes.

Relevance and Timeliness

There is no sign of saturation in the accumulation of AS introductions worldwide (Seebens et al. 2017), additionally the rate of spread for some species has also been shown to be increasing. In recognition of the growing threat of IAS to biodiversity, health and economies the EU has recently adopted a Regulation on IAS (1143/2014) which focuses on prevention as the most desirable approach to managing IAS. However, the challenges of gathering information on AS are recognized (and have been the focus of a recently completed COST Action TD1209). Recent developments in CS ensure the relevance and timeliness of this approach as an opportunity to improve data flow and knowledge on AS while ensuring effective and high quality societal engagement with the issue of IAS. The Action will address multidisciplinary research questions in relation to developing and implementing CS, advancing scientific understanding of AS dynamics while informing decision-making, specifically addressing technical requirements of the EU Regulation on IAS, support of the

EU biodiversity goals, and embedding science within society. The Action will explore and document approaches to establishing a European-wide CS AS network.

There is an opportunity to ensure collaboration and coherence among emerging AS CS initiatives which are developing rapidly in some countries, and extend AS CS initiatives to countries where these are less developed. There is a need for increased connectivity and networking to maximise benefits to citizens, including education, while ensuring the uptake of the data to inform action and decision-making across Europe. Furthermore, it is extremely timely to raise the profile of AS CS with policy-makers who may be reluctant to use CS data but are increasingly recognizing the opportunity of making science more relevant to people and society while leveraging large datasets. Indeed the Action also has the potential to contribute to the Juncker's Commission priorities such as the "Digital Single Market" and "Democratic Change", especially through Better Regulation. Under its commitment to Better Regulation, the Commission undertook a "Fitness Check" of the Nature Directives, which concluded that there is a need to improve the effectiveness and efficiency of their implementation by working in partnership with different stakeholder communities in Member States and across the EU to deliver results. The resulting Action Plan for nature, people and the economy (SWD(2017) 139 final) presented in the Communication of the Commission (COM(2017)198 final) and relevant accompanying material) acknowledges that nature protection can benefit from engaging citizens in the implementation of environmental legislation, and advocate to improve synergies while implementing these policies, e.g. the EU Regulation on IAS. Indeed the Action Plan for nature, people and the economy (SWD(2017) 139 final) provides a timely opportunity to engage young people through the European Solidarity Corps (launched by the EC in 2016) by providing activities (monitoring of species and habitats, ecological restoration activities, identification and eradication of invasive alien species, etc.) relevant to nature protection in Natura 2000 sites. Therefore, the aims of this Action are aligned with Priority D: Better communication and outreach, engaging citizens, stakeholders and communities.

In summary, there has been considerable enthusiasm around the use of CS for investigating AS. However, there is a lack of cohesion between initiatives and limited sharing of good practice within countries but also regionally and across Europe. The poor interconnectivity between networks, and projects within them, is causing confusion not only with citizens, who may not see a clear route to participation, but also with the many potential end-users. There is a clear need to move forward in an informed and inclusive way to particularly tackle IAS related issues. CS approaches provide exciting opportunities for meeting this need while deeply engaging diverse stakeholders.

Objectives

Research Coordination Objectives

The overarching aim of this Action will be to maximize the potential of AS CS to meet scientific and policy needs while improving the experience of participating citizens through effective engagement and knowledge exchange.

The Action will achieve the following Research Coordination Objectives:

1. How to improve the IAS data collection benefiting from promising innovative approaches to CS, specifically taking account of advances in tools and technologies?
2. What are the best practices in data management and standards specifically in relation to IAS, especially considering their applicability across CS data initiatives?
3. What is the current quality of AS CS data? How to identify and deal with bias? What are the needs and formats for information by different user groups including European and national bodies involved in implementation of policy instruments, the scientific research community, stakeholders and stakeholder associations, and citizens?
4. How to improve approaches to engage people within AS CS? Including (1) European and national bodies involved in implementation of policy instruments (2) the scientific research community, (3) stakeholder associations, and (4) citizens. The Action will specifically consider motivation but also ways to ensure uptake by different user groups acknowledging cultural differences both within Member States and across Europe bridging the gaps between countries and regions with differing legacies of expertise in CS.
5. Assess the application of CS to (I)AS (across all environmental domains) monitoring and surveillance
6. Implement a Europe-wide CS network building on existing partnerships and initiatives, and aiming to create synergies across environmental/biodiversity goals that overcomes cultural and language barriers.

The activities, using COST networking tools, employed to achieve the Research Coordination Objectives, will lead to key outcomes and associated deliverables (see GANTT Chart for timeline Fig. 1):

- Interactive guide on best practices for AS CS focusing on approaches to CS alongside relevant tools and technologies (with provision for updating as new tools emerge but including horizon scanning for relevant new technologies) and underpinned by semi-systematic reviews published within peer-reviewed (open access) journals.
- Review of best practice in data management and standards, specifically in relation to AS CS data but with applicability across CS data initiatives, linking to existing data standards authorities and networks such as Darwin Core.
- Recommendations on design of CS initiatives to enable effective application of analysis methods, accounting for potential bias within CS data and recognizing the needs and formats for information by different user groups. Specifically the Action will develop on-line tools delivered through existing platforms such as ZOON (https://mran.revolutionanalytics.com/package/zoon/) alongside a gallery of exemplary data visualizations.
- Document methods, through case studies, of engaging people with CS and specifically review motivation for participation, acknowledging cultural differences both within Member States and across Europe, and accounting for different user

groups (1) European and national bodies involved in implementation of policy instruments (2) the scientific research community, (3) stakeholder associations, and (4) citizens.

- A coherent and coordinated European-wide CS initiative for monitoring IAS linking with existing projects, networks and partnerships, creating synergies across environmental/biodiversity goals including the development and implementation of a distributed networking approach that addresses cultural and language barriers.

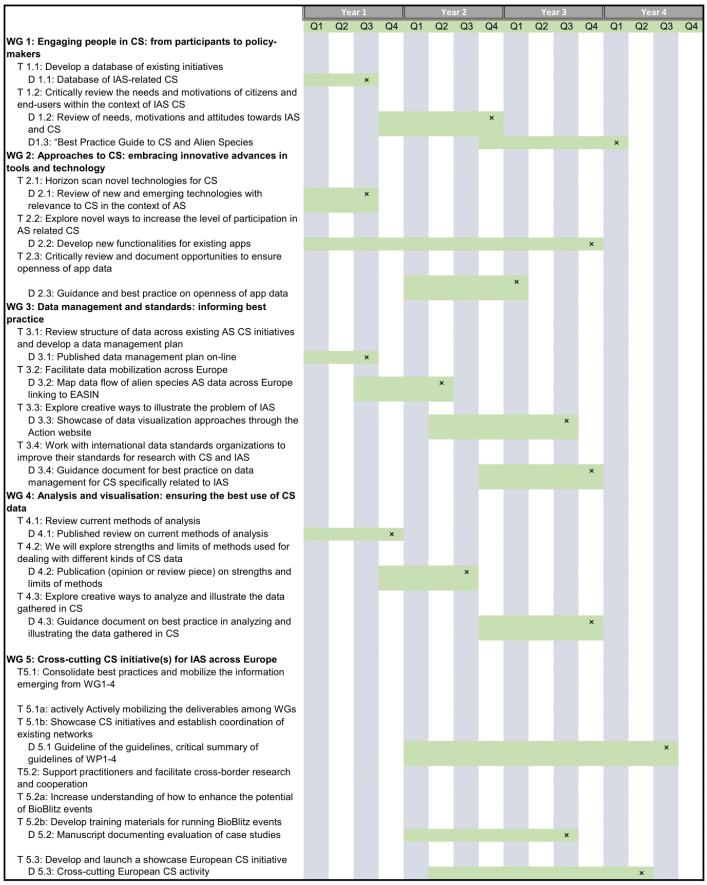

Figure 1. doi

Gantt chart summarizing the planned tasks of the Working Groups.

Capacity-building Objectives

Engagement in AS CS varies significantly across Europe. The COST Action CS-EU (CA15212) "Citizen Science to promote creativity, scientific literacy, and innovation throughout Europe" recognizes that engagement and expertise in CS varies across the European Research Area "*with some countries with strong levels of activity and networking*

and some with much lower levels". The Action will pursue the following Capacity-building Objectives

1. Increase inclusivity by establishing a network across the 36 COST Member States and Cooperating States (extending to near neighbours and international partners) to deliver the aims of the Action while enhancing skills throughout the network. ITCs will be included throughout the Action including through leadership of WGs and associated activities (including hosting). The Action will specifically collaborate with the CS-communities already active in the fields of AS and biodiversity.
2. Increase the skills and opportunities to share knowledge, innovation and experience through the Action network by including a diversity of stakeholders (academics, decision-makers, NGOs, industry, citizens and others). The action will build on the experience from previous COST Actions relating to AS including TD1209 ALIEN Challenge and ES1304 ParrotNET, and will link with the current COST Action CS-EU (CA15212) including potential cross-Action activities.
3. Increase opportunities for sharing experiences (mostly country-level but recognizing other scales too) and increase the capacity to network and share insights, especially in those countries in the network that need to develop new activities with respect to IAS CS.
4. Increase resources to involve Early-Career Investigators (ECIs) in the Action through active participation using all the COST networking tools but also inclusion at the core of the Action Management Committee through leading roles alongside established mentors (also supporting the European Solidarity Corps).
5. Increase access to knowledge and information on AS in Europe, with relevance to the implementation of the EU Regulation on IAS, but also for the other nature protection Directives (e.g. Habitats and Birds Directives) and the EU financial programmes (e.g. LIFE, Horizon 2020, Erasmus). Another important contribution would be through the development of indicators on public perception of problem (response action).

The activities, using COST networking tools, employed to achieve the capacity-building objectives, will lead to key outcomes and associated deliverables:

- Collaboratively and inclusively document research priorities (and skills gaps) across the Action network and create opportunities to develop collaborative research projects in response to EU funding sources.
- Drawing on expertise within CS-communities already active in the fields of AS and biodiversity address skills gaps through Short-Term Scientific Missions (STSMs >20 across the four years), training schools (four across the four years) and focused interactive workshops (six across the four years) maximizing opportunities for ECIs but also ensuring access to all participants.
- Invite stakeholders (academics, decision-makers, NGOs, industry, citizens and others) to two dissemination events to share knowledge, innovation and experience on AS in Europe.
- Mentor ECIs in leadership through inclusion at the core of the Action Management Committee in roles alongside established mentors.

Progress Beyond the State-of-the-Art and Innovation Potential

Description of the State-of-the-Art

CS, the involvement of volunteers in the scientific process, has a long history extending over hundreds of years primarily through biological recording (essentially spatial and temporal occurrence of species documented by enthusiasts). New technologies have revolutionized CS and increased the potential for access by many more people than have traditionally been involved. Additionally advances in data management, in analysis and in innovative visualization of results have rapidly progressed, providing opportunities to ensure effective and imaginative use of CS data (Schade et al. 2017). Social online media are proving important to monitoring, prediction and modelling of trends and patterns in a broad range of environmental domains. The pervasiveness of mobile devices with cameras combined with a broad set of social media channels provides great potential for real-time observations of ecologically relevant information that can be contributed with ease.

Concurrently there has been increasing recognition of the threat posed by IAS and the need for accurate and timely-provided information for prioritization and management. The EU Regulation on IAS reflects this through a focus on prevention via effective surveillance and monitoring referring to volunteer participation (including citizen science, public awareness and education) in decision-making. CS provides a mechanism to achieve this outcome. Although AS information, including data on occurrence of species, has been undertaken by professionals including academics and governmental employees, it is acknowledged that there is potential to widen participation through involvement of volunteers in CS initiatives. Concerns that the quality of information gathered by volunteers rather than professionals would be inferior are beginning to abate and focus has shifted to consideration of approaches to maximize engagement and utility of the data for early-warning, containment and monitoring spread. However, it is still important to acknowledge and reconcile ongoing and emerging issues such intellectual property rights, legal complications and biases within the data.

Specifically national, regional, and international networks are emerging and embracing different topics and approaches. As examples, the European CS Association, counterparts at national levels (e.g. in Spain or Germany), the CS Task Force of the European Network of Environmental Protection Agencies, the European Commission ‘Environmental Knowledge Community’ CS Innovation Project, a COST action dedicated to Citizen Science (CA15212), clusters of EU-funded projects such as the Citizens Observatories, etc. Concurrently consideration is being given to documenting quality and standards exists for different components (INSPIRE for public authorities, OGC for geospatial information, Darwin Core for biodiversity records, etc.); however, since the data is so spatially biased, with some regions having a plethora of distribution data and others none, their usefulness is limited and there is scope for drastic improvement and guidance.

Progress Beyond the State-of-the-Art

The Action will ensure progress beyond the state-of-the-art by implementing the recommendations from the expert workshop “Citizen Science and Open Data: a model for Invasive Alien Species in Europe”, building on previous COST Action successes (e.g. TD1209 ALIEN Challenge), and linking with current relevant Actions (e.g. CA15212 CS-EU, CA16229 ENEC), with the primary aims of adopting and developing innovative approaches and best practice at all stages of the CS IAS data cycle (Cardoso et al. 2017). The Action will be dedicated to the theme of AS CS and so will provide depth to complement the breadth of other Actions (such as CA15212).

Interconnecting and extending existing networks will provide possibilities to address the particular challenges related to the gathering and sharing of AS information. Furthermore, the experiences and expertise that partners will bring to the Action will be from multidisciplinary perspectives. There is a need to extend the networks to encompass not only CS practitioners and scientists but also citizens and endusers. Typically CS has been most prominent in northern European countries but there is critical need, urgency and motivation to extend the reach across Europe.

Providing best practice guidelines and knowledge exchange, including data mobilization, integration and use in the area of IAS. The development of inclusive data standards through extensive consultation and ultimately consensus will address concerns and criticisms on the quality and utility of CS data which is often assumed not to be fit-for-purpose.

Developing methods and providing guidelines to improve data quality and quality of the science outcomes, distinguishing between accuracy of the data point, information content of the data set, and appropriate analysis to gain derived information from the data set and including issues of data bias and data management (including visualization).

Providing a framework for tools and data governance from different CS projects, upon which the dynamic and diverse fields of IAS data and information technology can be structured. It is all too easy for tools and standards to diverge when their developers work in isolation, without clear community guidance. The Action’s work will help standards and common tools to evolve and keep pace with the state of the art. The Action will support the interoperability of biodiversity and environmental data, particularly those data being collected in new and innovative ways, where tools and standards need to keep pace with these changes. The Action will provide an overview of the existing AS CS landscape by evaluating existing initiatives to understand the commonalities in methods and goals, in addition to the knowledge and skills gaps that can be addressed or need further exploration. Existing communities also have traditional tools, workflows and data standards. The Action will work with these communities to improve interoperability, for example, by mapping traditional terms onto international standards. Our framework will have to acknowledge and incorporate these traditional ways of working while providing routes to better international and cross-taxonomic integration.

There is considerable potential to collaborate on IT infrastructure to avoid duplication and foster re-use. Examples of open collaborative resources that have been used in CS projects include OpenStreetMap and Quantum GIS, but also application program interfaces, such as those provided by the Global Biodiversity Information Facility and Catalogue of Life. Often, CS is only part of a research portfolio used by biologists, therefore it is essential that tools are provided on a plug-and-play basis, already conforming to community standards and sufficiently configurable to allow for innovation.

The Action's framework will acknowledge and leverage the cultural differences and the multilingual communities of Europe. The Action will benefit from its diverse and multidisciplinary capacity, combining experiences in order to develop best practice guidelines, including better and more inclusive standards. Some CS groups have successfully leveraged social media such as Facebook and Twitter. Such tools can be used for teaching, outreach and communication, but they can also be used as an indication of public perception and mood. Guidelines are needed to make the most of the opportunities of social media, particularly as this relates to the specific circumstances of biodiversity, IAS management and CS.

The Action will inform international and continental organisations who provide standards useful to biodiversity and CS. It will provide knowledge exchange in subjects, such as data mobilization, integration and use in the area of AS. The participation of ECIs from the Action in data governance is an essential element to the long-term sustainability of standards organizations and facilitating the two-way flow of information from the users of tools and data to their creators. The Action will also be able to create expertise and guidelines relevant to other thematic areas that want to understand and apply CS as part of their research and outreach.

Innovation in Tackling the Challenge

The Action will connect expertise on biological invasions, CS and data management across Europe in order to address policy relevant challenges continentally and raise the profile of CS and AS. This Action will provide coordination through networking opportunities to existing activities while extending CS to regions where initiatives are lacking through shared infrastructures and increasing skills through training schools and STSMs across the Action network. The emerging tools and technologies not only add to the timeliness of this Action but also provide exciting opportunities for testing within the framework of AS. Good practice and innovative examples of using CS to address IAS will be collated and made visible across Europe through the Action website but also active dissemination of the information through various approaches including webinars and development of new training materials. The importance of interoperability and data standards will be at the core of the Action and new products will be developed that provide updates in relation to this in accessible formats. More generally, the Action will ensure the relevance of science to people, connecting them with the processes that lead to evidence that informs science and ultimately decision-making within countries and across continents. The potential to empower citizens within democratic participatory science and decision-making within

complex areas such as conservation, land management, trade and pest management will ensure social and scientific innovations and breakthroughs.

Added Value of Networking

In Relation to the Challenge

AS observe no administrative borders and need to be addressed through concerted action on a large spatial scale. The contributions of citizens to a sound knowledge base of AS traits (e.g. distribution, pathways, impact) is deemed crucial. However, the current landscape of AS CS initiatives is heterogeneous and fragmented. Cross-border cooperation and networking to share knowledge, leverage and extend the capacity to collect, share and analyse CS data is essential (specified within the EU Regulation on IAS). This should ensure a contribution of CS to the effective assessment and management of biological invasions building on enhanced understanding and trust of CS data.

In Relation to Existing Efforts at European and/or International Level

Using CS for continental wide AS research has numerous advantages, but the potential for sustained initiatives providing detailed observations over long-time and large spatial scales is exceptional. By coordinating current CS networks and supporting the building of new national and regional networks we will build capabilities and capacity. Furthermore, by encouraging participation on AS research we will galvanise effort towards a common goal, rather than more haphazard data collection that, while interesting, is less useful from a scientific point of view.

The network, including academics and citizen scientists, will offer many opportunities for social innovation, particular encouraging young people to participate in conservation and science, but also connecting generations, by linking the scientific education of the young with the traditional knowledge of older generations will ensure unique and complementary perspectives on AS are shared. The transdisciplinary nature of the Action will enable us to bring new ideas to problems of IAS and help us reach a broader range of stakeholders. By linking applied conservation researchers with social scientists, user experience specialists, software engineers and societies we will learn the needs of each other and produce better outcomes. For example, software that is not successful might fail to attract participants due to a misunderstanding of their needs, while even successful software, from a participant's perspective, may fail from a scientific standpoint by collecting the wrong sort of data or in the wrong format.

Expected Impact

Short-term and Long-term Scientific Technological, and/or Socioeconomic Impacts

In the **short-term** (within the timeframe of the COST action), our collaboration will help to mobilize AS information, provide and report on current trends for AS, support the implementation of the EU Regulation on IAS, raise public awareness, create new opportunities for ECIs, and stimulate discussions with diverse stakeholder groups (including citizens) through online tools but also face-to-face events about the related challenges (McKinley et al. 2017).

In the **medium-term** (in the years after the action is completed), scientists and society will benefit from an increase and more timely availability of AS information (McGeoch et al. 2015). This will be complemented by benefits for policy-makers with provision of a better evidence-base for decision-making contributing to improved management of IAS/AS and consequently decreased ecological and socioeconomic impacts of IAS leading to long-term benefits for biodiversity. Concurrently, we anticipate a cultural shift across sectors to accept and increasingly include CS activities as an integral part of meeting research and policy objectives, and approaches will be standardized in a way that results are easy to compare and integrate. Ultimately contributing to better management of IAS and consequently decrease their ecological and socio-economic impacts.

In the **long-term** similar approaches will emerge in other fields, and scientific literacy in Europe will increase. This network will allow communication, exchange of ideas, and feedback between the groups involved, and lead to improved management and policy for IAS across Europe.

The high impact outcomes anticipated from these Research Coordination Objectives include:

- Improved quality and accessibility to IAS/AS CS data in Europe
- Development of a clear route to facilitate citizen participation
- Development of guidelines for the end-users of CS data and information
- Developing innovative approaches and best practice at all stages of the CS IAS data cycle
- Establishment of an European CS base monitoring network on IAS

Measures to Maximise Impact

Plan for Involving the most Relevant Stakeholders

The Action will ensure strategic outreach through a detailed dissemination plan aimed at a range of relevant stakeholders including policy-makers and implementers, including national agencies; researchers and associated funding bodies; charities and NGOs such

as wildlife groups but also botanic gardens and museums; industry, educational establishments, CS associations. Participating volunteers (citizens) will be major stakeholders and the Action will engage many people and aim for inclusiveness in terms of age, ethnicity and gender, but demography and background.

The aims of CS includes at its core excellent engagement, and as such impact is inherent. CS will contribute to greater literacy across society on biological invasions which is crucial for tackling this global environmental issue. Some of the technological tools, such as smartphone applications or social media, are indeed used to interact with recorders. For instance, through dedicated smartphone applications for IAS recording, awareness raising can be achieved with certain groups of society (e.g. anglers, gardeners, beekeepers, hunters, farmers, environmentalists) that encounter IAS. The adopted EU Regulation on IAS envisages surveillance systems for IAS of Union concern (currently 49 species) to include both targeted and general surveys and to benefit from the involvement of different sectors and stakeholders, including regional and local communities.

Dissemination and/or Exploitation Plan

A detailed dissemination plan will be developed at the beginning of the Action according to COST guidelines which will expand upon the overview of dissemination outlined here. This plan will be an active document maintained by the MC to align with the Action's aims and specific deliverables. Given the wide range of stakeholders we will ensure there are both targeted and general dissemination activities. Some examples of the groups we will target and the approaches we will use are outlined below.

We will engage **citizens** in a number of ways, including through social media, along with articles in popular magazines and in the newsletters of relevant charities and NGOs, such as the Royal Society for the Protection of Birds and similar organisations that are currently deploying CS. We will be able to give examples of best practice regarding the collection of data, but also encourage participation, by explaining the need for data and the need for biodiversity conservation. We will also provide opportunities for face-to-face discussions at science festivals and other organised events across Europe.

Peer-reviewed scientific journals will be used to communicate outcomes relevant to **researchers and funding bodies**. We will select journals on the basis of ensuring ease of accessibility globally and high impact to the scientific community. We will also work with publishers to find effective dissemination methods, such as creating special issues of journals or collections of related articles. Furthermore, we will maintain a blog and issue press releases as appropriate throughout the Action.

To communicate our outcomes to **policy-makers** we will engage with key organizations globally, such as IPBES, but also continentally and nationally including non-native species secretariats and NGOs. This will take the form of policy briefs, but also providing scientific expert opinion to green papers of the EU. At a regional level we will invite local decision-makers to participate in our events in providing opportunities for interactive engagement. Such communications will also consider the needs of **research agencies and funding**

institutions, collaboratively highlighting where research is needed and areas where research funding will produce the greatest value outcomes.

Short-term Scientific Missions, hackathons and other collaborative meetings will foster interactions and cross-Action projects. They will link different types of r**esearch, industry** and **citizen groups**, finding common goals, novel applications and solutions.

Social media will be used as a **general dissemination** platform with cross-Action scope. It will be used for rapid communication and advertisement of events. Social media will also be a way to reach other interested groups who were not considered in the initial stages based on their response. It will be particularly important for two-way communication between the Action and stakeholders, providing access to community networks.

Potential for Innovation versus Risk Level

Potential for Scientific, Technological and/or Socioeconomic Innovation Breakthroughs

This Action will bring together citizens and scientists linking to relevant end-users across Europe to find solutions to the threat of IAS recognized as a major environmental challenge across the globalized world. By getting involved with AS, CS initiatives will provide the opportunity for excellent engagement, specifically highlighting the challenges of IAS policy and management options. We will actively foster, connect and develop CS that involves people from across diverse communities in the scientific process. We recognise the rich legacy of volunteer involvement biodiversity monitoring across Europe while acknowledging that the level of activity has not been uniform across Member States. Thus, there is considerable potential for sharing innovations while considering cultural differences and resource constraints within and between Member States. The risk of low levels of participation will be offset through ensuring relevance of initiatives while considering approaches to inclusivity (indeed WG1 will focus on ways to engage people and WG2 on novel approaches so further decreasing this risk). Guidance on designing projects that make the participant think about the issues and outcomes that support human and environmental needs will be provided. We will also promote inclusive projects that are accessible to all and suitable for a wide age range and a diversity of cultural backgrounds.

Novel digital tools are increasing the amount and quality of CS data on IAS. These include data and image mining from social media and the use of improved analysis methods such as geographic information systems, spatio-temporal analysis, and sentiment analysis. The tools with which they can be applied are changing rapidly, from smartphones to other types of wearable crowdsourcing tools, such as those to interpret images from wildlife cameras, are increasingly used to reach a wider audience on IAS and to involve citizens in recording them as sensors. Apart from tools that foster mass participation, more complex technologies are available, including, sensors, augmented reality, drones and image recognition that require dedicated training. Collectively, these technologies have the potential to engage broad audiences, motivate volunteers, improve data collection, control

data quality, corroborate model results and increase the speed of decision-making while reducing uncertainties.

The current explosion of digital technologies provides many opportunities, but also challenges to the IAS community. Real-time recording and rapid validation procedures, proper data management and swift data mobilization are indispensable to this aim (see WG3). Additionally, invasion and impact monitoring require more diverse data capture and next generation geospatial information infrastructures.

Description of the Work Plan

Description of the Working Groups

The Action will focus on five interlinked working groups with four being coherently organized around the data life cycle and the fifth providing an opportunity to demonstrate developments and innovations emerging from the others (Fig. 2). WG activities will be organized to ensure integration across WGs comprehensively using the COST networking tools to deliver an effective but flexible work programme. ECIs will be involved in the organization and implementation of the WG activities including devising programs, chairing sessions and leading outputs and deliverables with support and mentoring, as required, from other members of the Action. Activities organized in Member States designated as Inclusiveness Countries will be prioritized with the aim of widening participation and showcasing expertise across Europe.

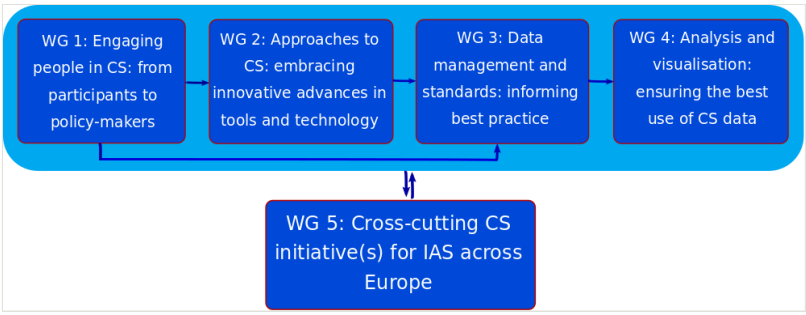

Figure 2. doi

Pert chart showing the interrelationships between the Working Groups.

WG1: Engaging people in CS

From participants to policy-makers we will review the ways in which different CS initiatives engage target audiences, recognizing the diversity of contributors and end-users. There will be focus on engaging end-users and ultimately policy-makers with the aim of producing results that are accepted and used not only at scientific levels, but also at management and policy levels.

Task 1: Develop a database of existing initiatives/approaches/activities/strategies used to engage citizens with AS from across Europe and link to distributed network that overcomes cultural and language barriers ultimately developing a glossary of terms (translated into major European languages) and key concepts relevant to CS and AS contexts.

Task 2: Critically review the needs and motivations of citizens and end-users within the context of AS CS, involving scientists and social scientists to consider attitudes towards AS, CS and the connections between the two themes. Identify spatial biases in the degree of CS involvement across Europe and consider cultural and language barriers.

Deliverables

1. Database of AS-related CS (Task 1)
2. Review of needs, motivations and attitudes towards AS and CS (Task 2)
3. "*Best Practice Guide to CS and Alien Species*" translated into different languages and focusing on how to engage different stakeholders, including the best approaches/activities/strategies for each target-group (Task 1 and 2)

WG2: Approaches to CS

Embracing innovative advances in tools and technology will explore the value of new and emerging technologies for CS in the context of AS recognizing the contribution of volunteers. The growth in AS datasets has been fostered by technological developments such as social media, apps, low-cost sensors, search engines and predictive analytics. These technological developments, an increased attention to CS and a cultural change towards collaboration and openness in research within the policy agenda (https://ec.europa.eu/digital-single-market/en/open-science), will lead to a further increase of the contribution of volunteer recorders

Task 1: Horizon scan novel technologies for CS

Task 2: Explore novel ways to increase the level of participation in AS related CS (e.g. from occurrence reporting to impact monitoring) and to reach non-traditional audiences of citizen scientists (linking to WG 1; Task 2).

Task 3: Critically review and document opportunities to ensure openness of app data, app code etc. e.g. through the EU CS platform under development within the JRC.

Deliverables

1. Review of new and emerging technologies with relevance to CS in the context of AS (Task 1).
2. Develop new functionalities for existing apps (e.g. gamification, scraping social media for pathways, trade and occurrence data) through a Hackathon involving citizen scientists and app developers (Task 2).
3. Guidance and best practice on openness of app data, app code etc. (Task 3; Linking to WG1; Task 1)

WG3: Data management and standards

Informing best practice will develop guidance and associated training to improve the quantity, quality and usability of AS data collected by citizens. Data standards do exist, such as Darwin Core and ABCD, but their adoption is not universal and these standards need development to make them more appropriate for the breadth of data that are collected on biodiversity by citizen scientists. This includes data terms that are largely specific to IAS, such as management methods and impacts, but also ways to describe methods used by citizens. Data management is fundamental to the success and long-term impact of a CS project, yet it is often not considered until the end of the project, by which time decisions made at the beginning of the project can limit the choices for data reuse. From the outset of the Action we will create a data management plan collaboratively to guide our work recognizing IAS data, and their uses, are not identical to other biodiversity data. The need for rapid and focused data mobilization is particularly important for a response to new species introductions. This is where we will address issues of sensitive data and data sharing.

Task 1: Review structure of data across existing AS CS initiatives within Europe and develop a data management plan for the Action to cover any data and other outputs from the project.

Task 2: Facilitate data mobilization across Europe, particularly of Biodiversity data as that relates to AS, including linking ECIs in short-term scientific missions with experienced data managers to facilitate data publication.

Task 3: Explore creative ways to illustrate the problem of IAS through novel visualizations of data and innovative mash-ups of data from different domains (linking to WG4).

Task 4: Work with international data standards organizations to improve their standards for research with CS and IAS.

Deliverables

1. Published data management plan on-line including standards to be used, the terms for data sharing and the long-term preservation of data (Task 1).
2. Map data flow of AS CS data across Europe linking to EASIN (Task 2).
3. Showcase of data visualization approaches through the Action website (Task 3; linking to WG4).
4. Guidance document for best practice on data management for CS specifically related to IAS (Task 4; Linking to WG1).

WG4: Analysis and visualisation

Ensuring the best use of CS data will consider methods for maximising the use of CS data in the context of AS. CS provides a powerful approach to collating largescale and long-term information critical for understanding biological invasions and informing decision-making. However, since information is gathered by volunteers, often at places and times convenient

to them, this can lead to biases in sampling, leading to multi-dimensional (spatial, temporal, or data quality) data biases. WG4 will consider approaches to address such biases and ensure maximum utility of the data and effective communication of outputs to all relevant end-users through using cutting-edge analytical tools and creative visualisation.

Task 1: Review current methods of analysis and how these are appropriate to different CS datasets and different purposes (unstructured vs. structured monitoring; experimental designs (e.g. adapting BACI experimental design for CS), presence-only, presence-absence, sessile organisms (plants, leaf miners etc) vs. motile animals. Developing recommendations for standards for data collection, preparation and analysis, and identifying best practice examples for scientific uses.

Task 2: Explore strengths and limits of methods used for managing different kinds of CS data to provide relevant information for end-users. This include the i) testing of different proxies for recording intensity (e.g. using co-variates, applying self-learning algorithms), ii) testing tools for data quality (e.g. assessor self-rating rules, groups assessment tools), iii) identification of uncertainties (spatial, temporal), and iv) 12 testing of proxies for recording likelihoods as a function of the novelty of a record (to account for the fact that abundant AS are less likely to be reported than emerging ones).

Task 3: Explore creative ways to analyze and illustrate the data gathered in CS to inform the public and decision makers effectively. This includes using real-time data and output visualization tools and innovative mashups of data from different domains (linking to WG3) that allow to rapidly report AS, and that provide additional relevant information (e.g. level of uncertainty). We will review existing analytical and data presentation and visualization tools and identify emerging tools and developments.

Deliverables

1. Published review on current methods of analysis and how these are appropriate to different CS datasets and different purposes (Task 1).
2. Publication (opinion or review piece) on strengths and limits of methods used for managing different kinds of CS data to provide relevant information for end-users (Task 2).
3. Guidance document on best practice in analysing and illustrating the data gathered in CS to inform the public and decision makers effectively (Task 3).

WG5: Cross-cutting CS initiative(s)

Cross-cutting CS initiative(s) for IAS across Europe will (1) coordinate and facilitate the flow of information among WG1–4 to efficiently maximize the impact of the Action across Europe and beyond, and (2) showcase case studies of CS initiatives with the aim of testing the best practice guidelines developed in WG1-4. The main objective of this WG will be leveraging and expanding the existing IAS-focused networks and activities in Europe that will be included so as to represent diverse CS approaches (Fig. 2).

Task 1: Consolidate best practices and mobilize the information emerging from WG1–4. a) Actively mobilizing the deliverables among WGs to enhance a timely use of the information created by them (e.g. Task 3 of WG3 linked to WG4) b) Showcase CS initiatives (e.g. Deliverable 1 and 3 of WG1) and establish coordination of existing networks that will be selected as cross-cutting case studies.

Task 2: Support practitioners and facilitate cross-border research and cooperation to further develop the potential of BioBlitz to engage people in CS while mobilizing IAS data including collaboration with ECSA and the Horizon 2020 project DITOs, a) Increase understanding of how to enhance the potential of BioBlitz events as repeat monitoring events for IAS (from recommendations of the DITOs policy brief #1). The versatility of BioBlitz events provides the opportunity to test applicability of best practice guidelines for different CS approaches b) Develop training materials for running BioBlitz events to maximize utility for gathering IAS information specifically in relation to the IAS of EU Concern documented within EU Regulation 1143/2014 on IAS.

Task 3: Develop and launch a showcase European CS initiative, building on existing activities and networks, in order to test best practices developed in WG1–4.

Deliverables

1. Documentation on the links between outputs (Deliverables) of WG1–4, emphasizing how information among WGs has been shared to maximise the impact of the Action (Task 1a and Task 1b)
2. Manuscript documenting evaluation of case studies based on guidelines developed in WG1–4. Outcomes used to inform development of training materials and guidance document for running BioBlitz events focused on IAS (Task 2a and 2b).
3. Cross-cutting European CS activity (Task 3)

Risk and Contingency Plans

The Chair, the Vice-chair and the Managing Committee (MC) will be responsible for identifying potential risks, their impacts and for taking a risk response and mitigation actions. They will develop a Risk Assessment and Contingency Plan at the start of the Action including a list of identified risks, their root causes, the main impacts and risk response and mitigation measures. Indicative list of risks and risk responses and mitigation measures is as follows:

1. The objectives are not achieved at the end of the time scheduled: Regular checking of results and taking any necessary corrective actions to meet the plan.
2. A leading partner decides to leave the Action: The MC will look for another Proposer to take over the tasks and responsibilities to lead the Action to success.
3. Lack of communication among partners: More frequent interactive communication means, e.g., Skype calls and even face-to-face meetings.

4. Schedule and cost limitations: The MC will monitor the schedule and the work progress tightly. The MC will also monitor costs by planning the Action's activities carefully.
5. Delay in submitting deliverables (e.g.: publications): Each WG will set a detailed schedule and work-plan to ensure the risk of delay is minimized.
6. Low participation in the activities, especially STSMs and TSs: Specific actions will be targeted to encourage participation. An STSM and TS coordinator will be appointed.
7. Failure to reach the necessary number of stakeholders and not having the promised impact.

A tailored management plan will be elaborated to make use of the Action Members' resources in relevant fields of expertise, as well as to strengthen information and dissemination procedures.

Management Structures and Procedures

The Action will be managed in accordance with COST rules. The MC will primarily be involved in monitoring the progress of the Action, approving annual reports, overseeing budget allocations and ensuring inclusiveness. A core group will be formed to oversee some of the more detailed planning and procedures but ensuring approval from the entire MC for delegated actions. The core group will include the chair, vice-chair, all WG leaders, dissemination and outreach officers, STSM and Training School coordinator and the budget holder. In all positions (other than chair and vice-chair) there will be at least two people assigned and always including an ECI.

The MC will meet annually but the core group will ensure communications at regular intervals throughout the year and will meet every three months either virtually or in person. The core group will be agreed at the kick-off meeting and delegated actions will be collectively approved. There will be agreement on communication between WGs and the core group will ensure coherence and coordination.

Each WG will have two leaders and may appoint additional participants in leading roles to ensure the work plan is met. The WGs will ensure regular updates through e-mail communications to the MC and posts on the website. They will provide formal reports twice a year in line with their meetings which will be at least twice a year and encompass the range of activities (workshops, conferences, seminars) relevant to their work plan. Membership of the WGs will remain open throughout the Action with opportunities for participation ensuring inclusivity and involvement of ECIs. The Action will support all participants but particularly ensure participation by female researchers and ECIs who will be encouraged to take on leadership roles. All ECIs will be invited to give presentations at the annual MC meeting.

The MC will monitor progress and achievements every 6 month and highlight opportunities for dissemination and outreach. The outcomes will be compiled within the Action progress

report crossreferencing the objectives and deliverables with relevant recommendations as required.

Dissemination and outreach will be a particularly important component of the Action. Therefore the dissemination and outreach officers in the core group will form a small team with participants from across the Action but ensuring 50% membership of Inclusiveness Target Countries (ITCs). The Dissemination and Outreach Team (DOT) will maintain the content of the website ensuring relevance to all the stakeholders outlined within the dissemination plan 2.2.2. The DOT will also seek opportunities to widen outreach and plan events to promote the Action and specifically the activities of WG5.

Network as a Whole

The network of proposers includes a diverse range of stakeholders including people from academic organisations, museums and botanical gardens Agencies and consultants. The proposers are leading in the fields of CS and biodiversity monitoring (and specifically invasion ecology) with expertise ranging from field ecology to social science. The Action will actively encourage wide participation and will welcome additional participants throughout. 15 COST Countries have participated in the proposal of which 40.0% are inclusiveness countries. The proposal has been led by two female researchers and included ECIs throughout from concept of ideas to drafting the proposal. The enthusiasm for this Action from so many COST member countries highlights the relevance across Europe. ITCs will be involved throughout the Action and across the management structure. The core group will be formed ensuring inclusiveness and activities will be organised in ITCs to provide maximum opportunities for participation and outreach in ITCs. The geographic distribution of participants will be across Europe and beyond. Two International Partner Countries have committed to the work plan of the Action. A number of International Organisations have contributed to the proposal including representation from Global Biodiversity Information Facility (GBIF), Biodiversity Information Standards (TDWG), European CS Association (ECSA), Biodiversity Observation Network (GEO BON), Long term ecological research (LTER), International Union for Conservation of Nature Invasive Species Specialist Group (IUCN ISSG) and European and Mediterranean Plant Protection Organization (EPPO).

The gender balance of the Proposers is even and measures will be in place to ensure the balance is retained and that there are equal opportunities for leadership and participation. 15.4% (=4) of the Proposers are ECIs and leadership roles have been identified for ECIs with mentoring as required. The proportion of ECIs is anticipated to increase with provision of activities such as STSMs and training schools but also through sessions at workshops, such as speed talks and interactive poster sessions, aiming to attract ECIs and encourage involvement.

Funding program

COST Alien-CSI Action CA17122 Increasing understanding of alien species through citizen science

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