

When and How are Smartphones Helpful for Environmental Monitoring

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#Latornell

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What We Did

Identified a research question



Developed a search protocol



Searched databases



Screened collected literature



Analysed literature



Research question

What is being written about how smartphone technologies contribute to community level environmental monitoring?



Search String

Activity

monitor* OR observ* OR surveillance OR record OR collect* OR inventory OR measurements OR identif* OR gather OR manage

Environmental Context

AND

environment* OR ecosystem* OR “natural resource*” OR conservation OR “resource management” OR species OR water OR wildlife OR ecolog* OR marine OR terrestrial OR biodiversity

Community Context

AND

“citizen science” OR community-based OR “community based” OR local-level OR “community science” OR “crowd science” OR “crowd-sourced science” OR “civic science” OR “volunteer monitoring” OR “networked science” OR “participat*” OR “local communit*” OR “community monitoring” OR “community groups” OR end-users OR landowners OR non-expert OR stakeholders

Smartphone Technology

AND

app OR apps OR smartphone OR “smart phone*” OR “mobile phone*” OR “mobile device*” OR “cell phone*” OR “cell phone technology” OR “cellular phone*” OR “mobile technolog*” OR iPhone OR iPod OR iPad OR Android



2,867 citations identified
(GeoBase, ProQuest, Scopus,
Web of Science)

2,363 titles and abstracts
screened for relevance

121 full-text articles
screened to confirm
relevance

71 articles included for
qualitative review



removed duplicates

- CRITERIA**
- ✓ *English*
 - ✓ *Primary research*
 - ✓ *Peer reviewed*
 - ✓ *Env monitoring*
 - ✓ *Local level*
 - ✓ *Smartphones*



5 Results Highlights

 *1. Literature is Growing & Global*

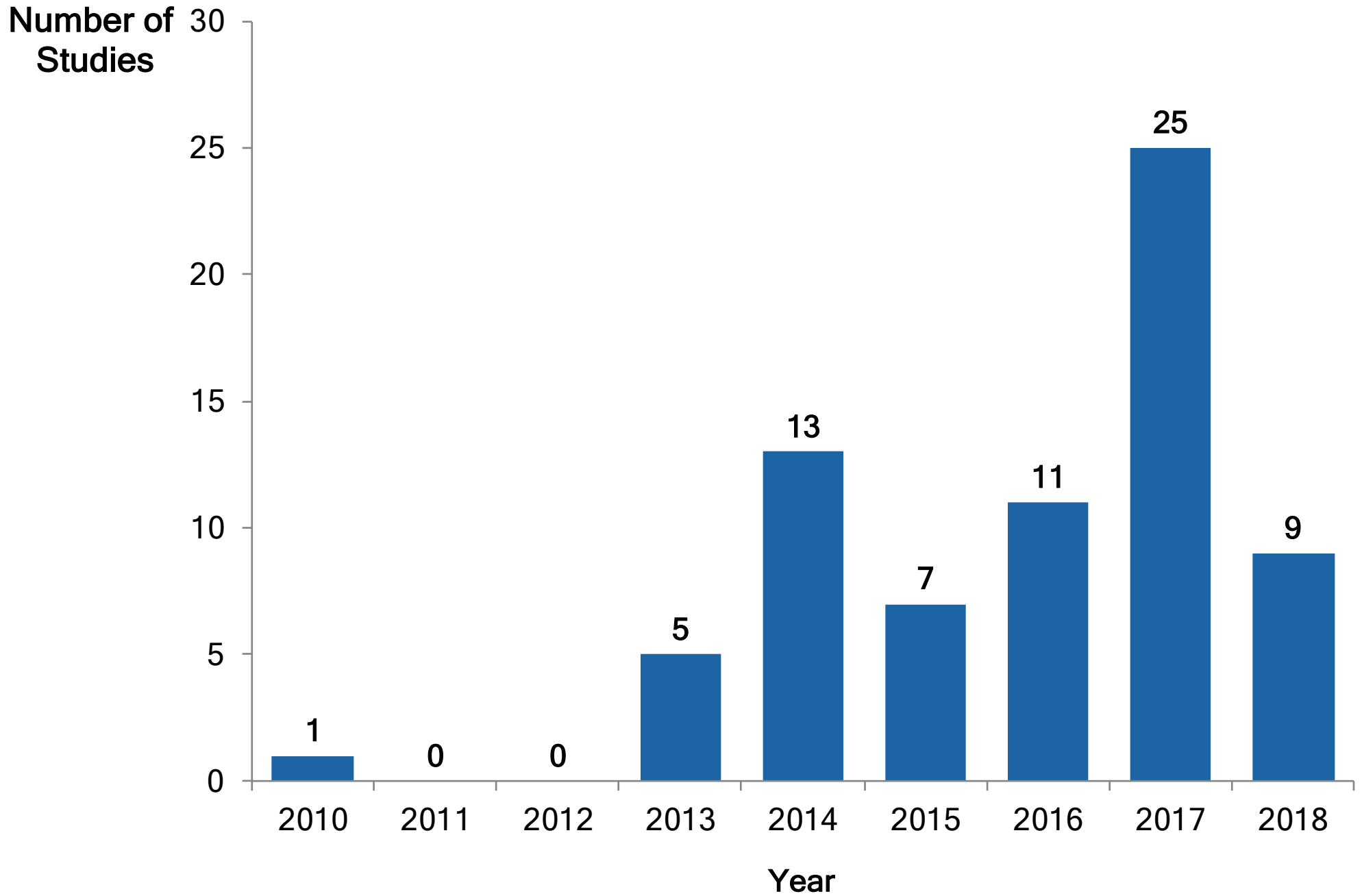
 *2. Assumed vs. Actual Benefits*

 *3. Development of Apps*

 *4. What is Being Monitored*

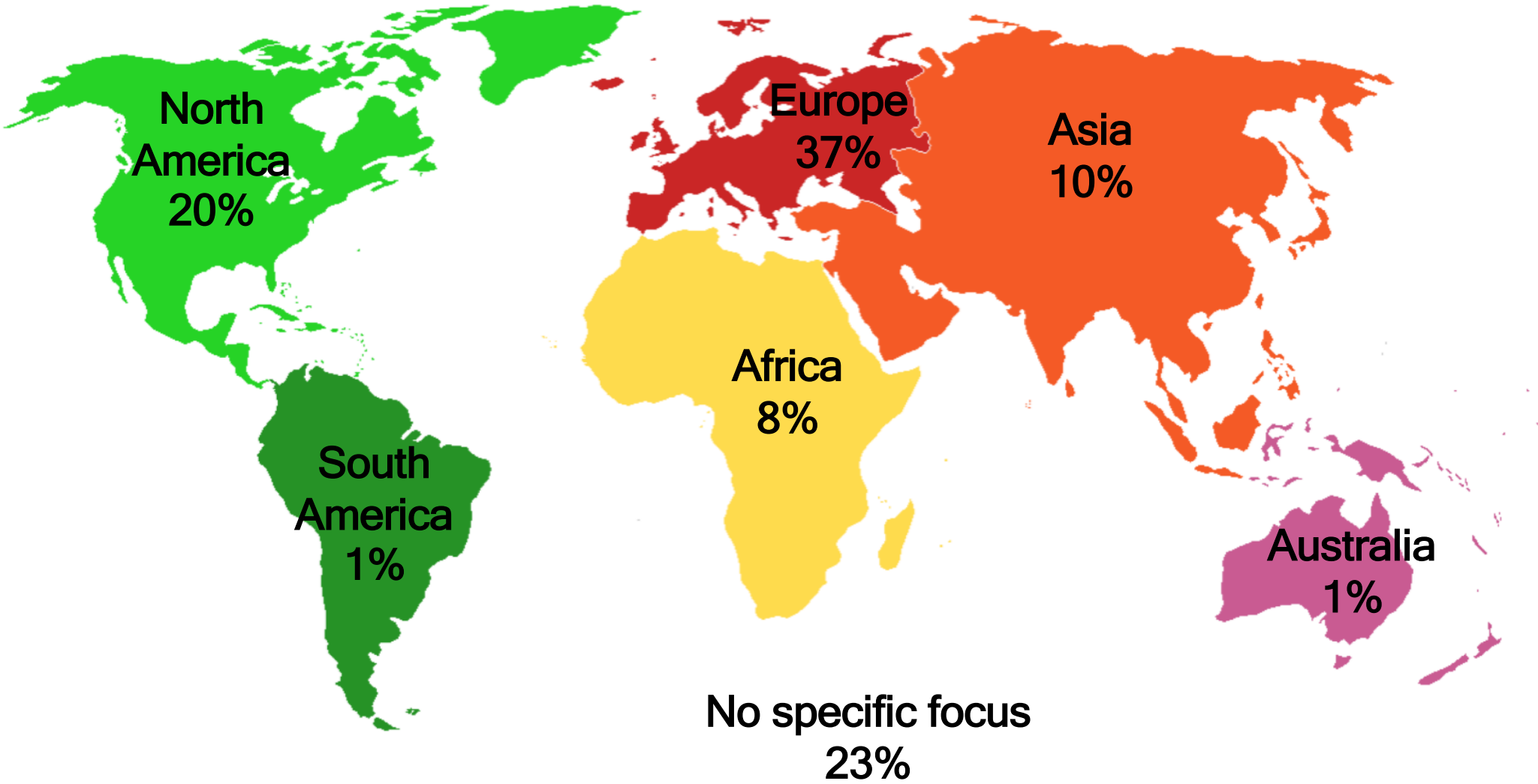
 *5. What Happens to Data (?)*

1. Literature is Growing & Global





1. Literature is Growing & Global





2. Assumed vs. Actual Benefits



Statements About Research Outcomes Were **Highly Speculative**

'may'

'could'

'might'

'possible'

'potential'



2. Assumed vs. Actual Benefits



Statements About Research Outcomes Were **Highly Speculative**

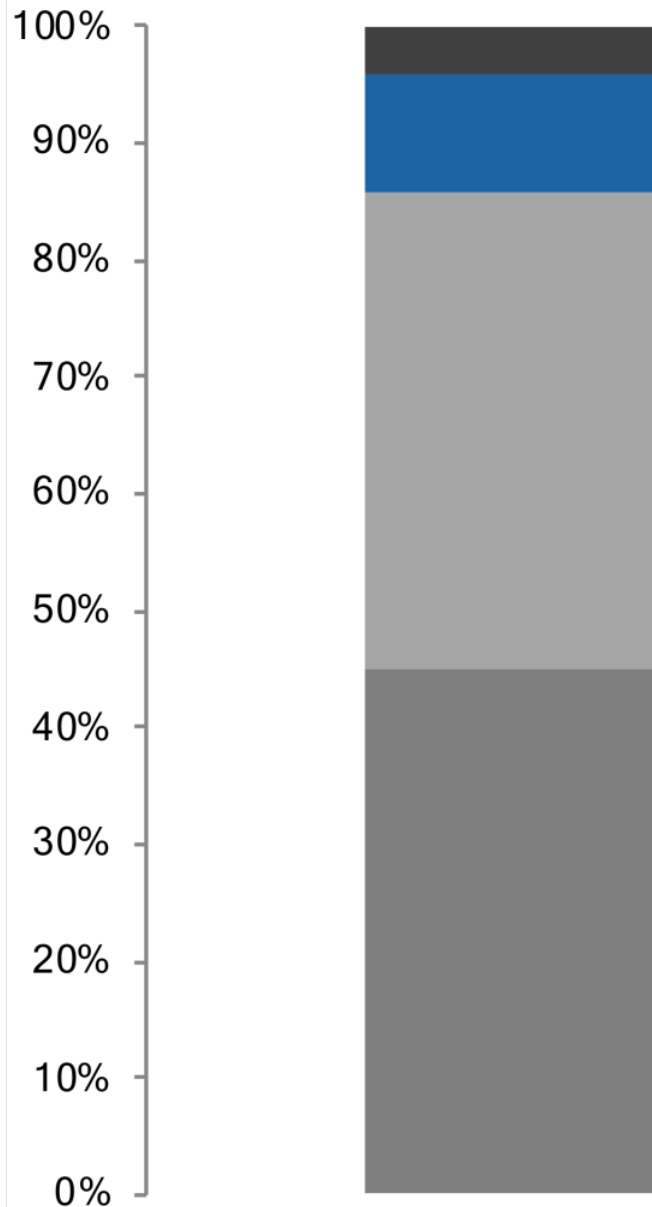
*“Experimental results show that, **if** the smartphone application is well tuned, **it is possible** to measure noise levels with an accuracy degree comparable to professional devices”*



2. Assumed vs. Actual Benefits



Very little evaluation of actual impacts or outcomes



4% investigated how people use an app

10% analysed data from an app

41% rationale & description of an app

45% investigated performance of an app



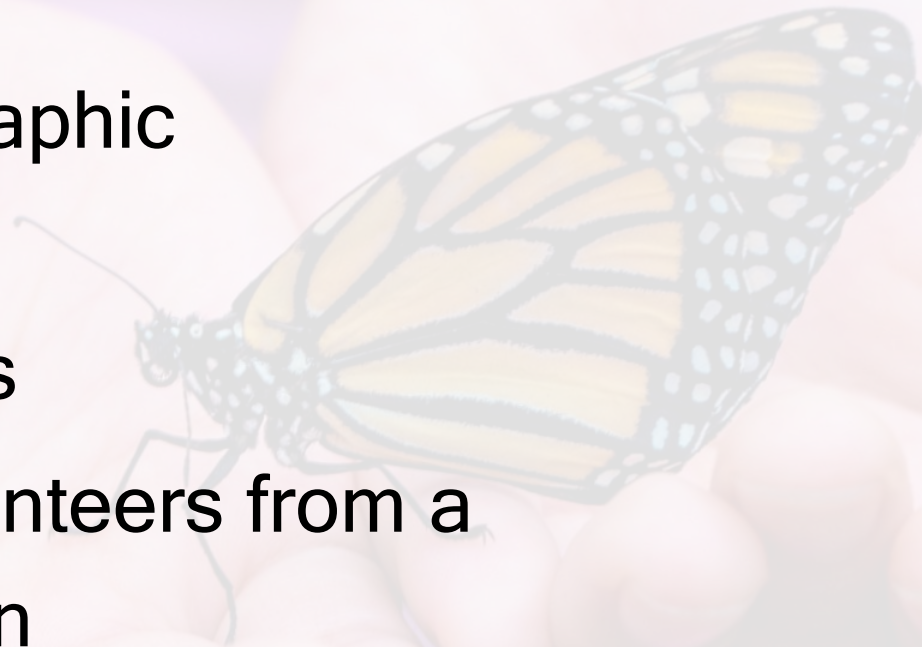
3. Development of Apps

70% of the apps were intended for citizen scientists

13% specific geographic communities

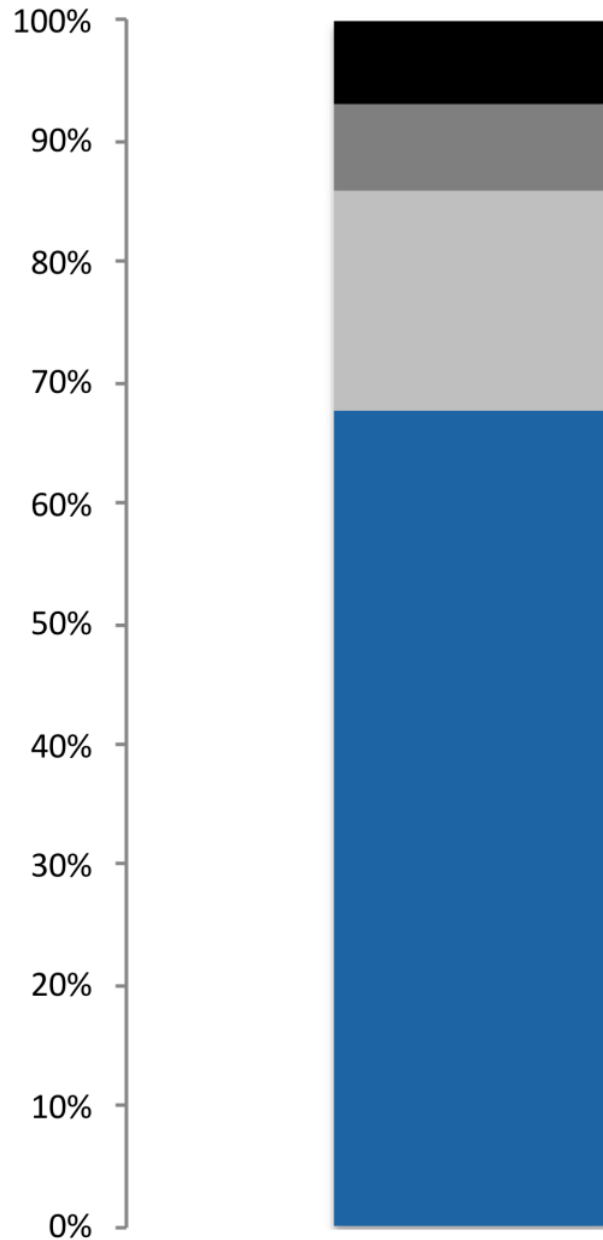
13% interest groups

4% employees/volunteers from a specific organization





3. Development of Apps



7% no mention of app development

7% used an existing app

18% built an app via third party platform

68% of the papers
created a new app



3. *Development of Apps*



69% of papers did not involve consultation with end users

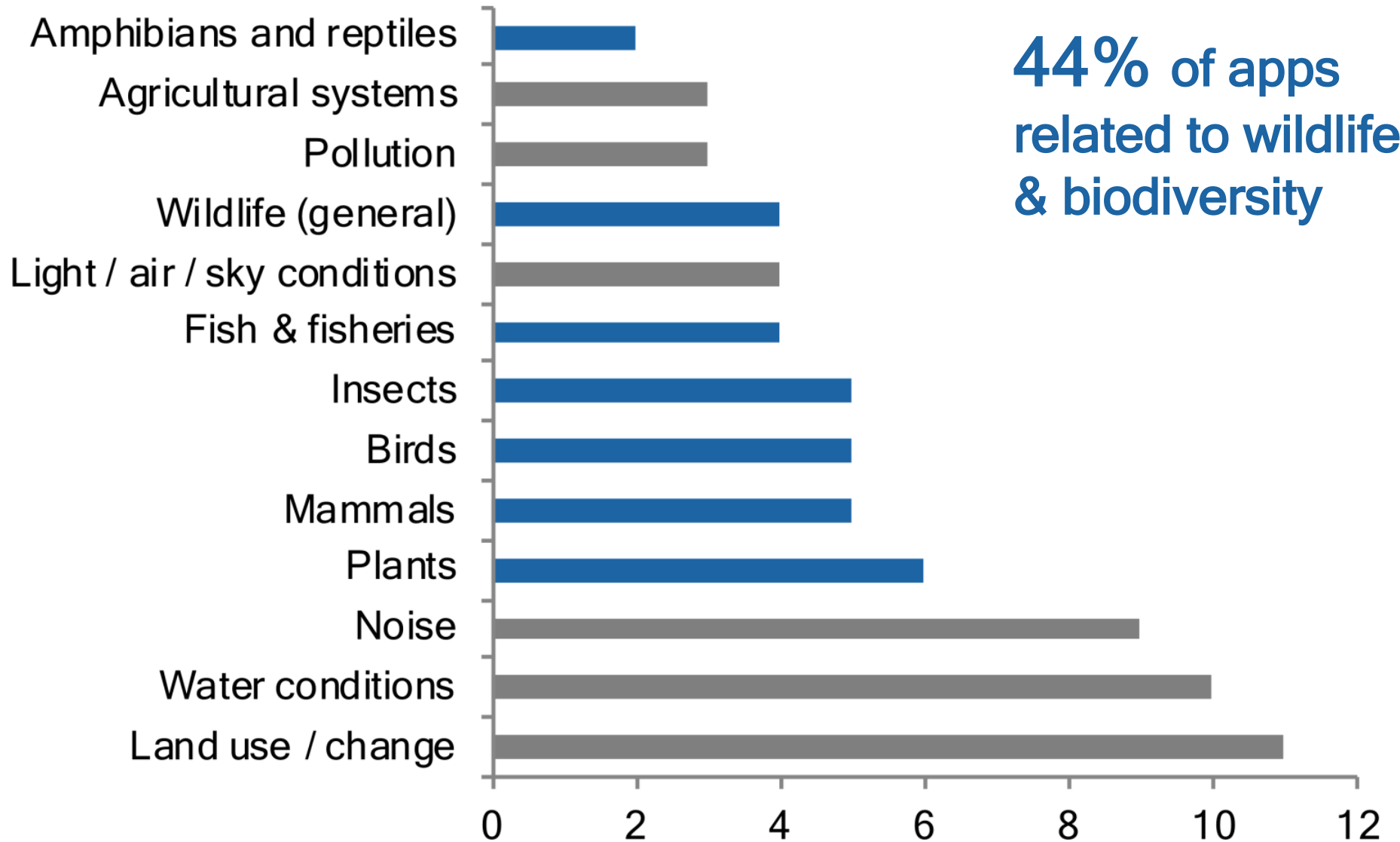
15% did consult with end users

15% no indication





4. What is Being Monitored

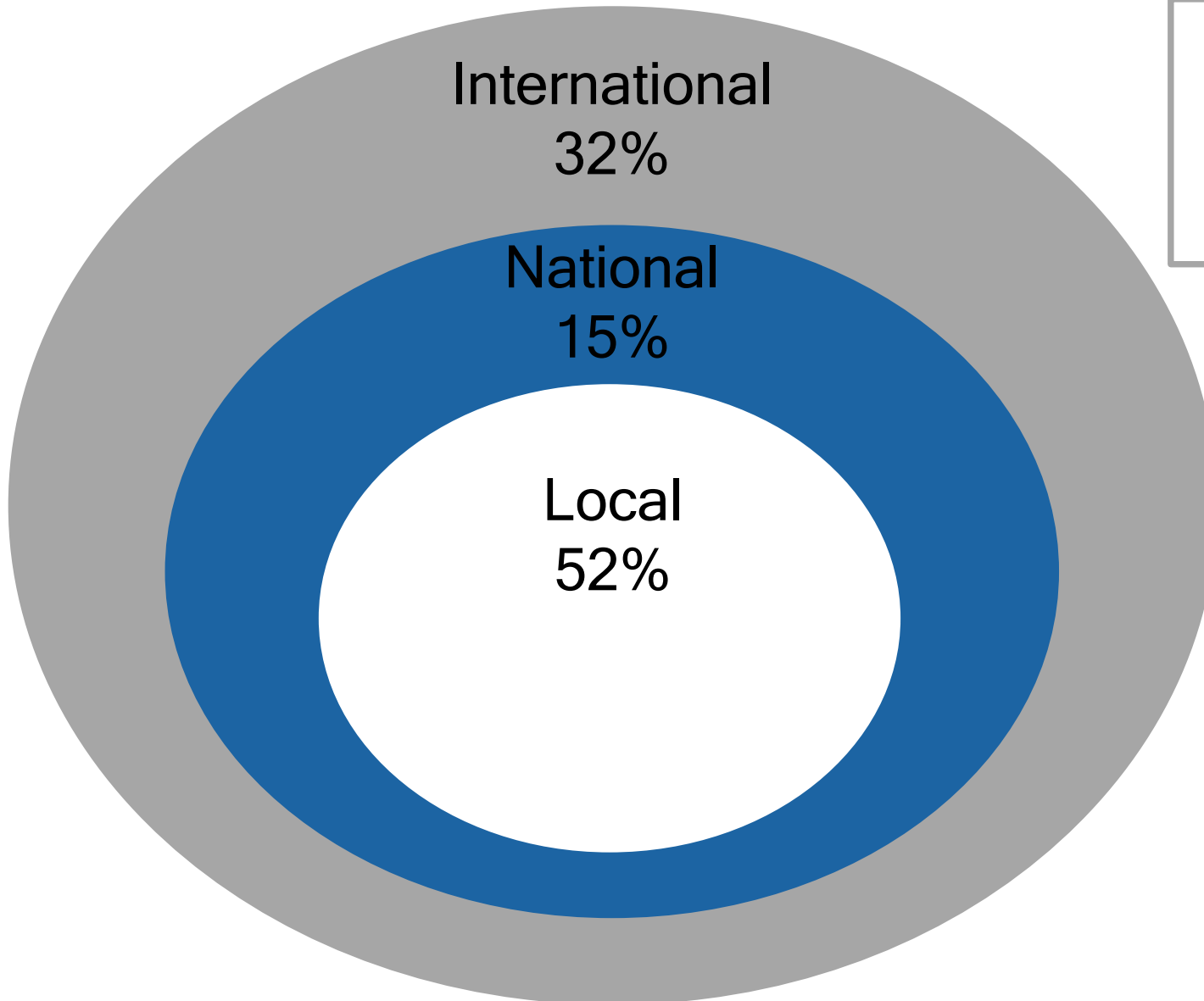




4. What is Being Monitored



Intended Scale of Use



Not all apps
involve
'big data'

↑ 5. *What Happens to Data (?)*



58% of the papers did not acknowledge who has **access to the data**



OPEN!

Take-Home Messages

Put People First

Need to connect data to
decision-makers

Community building is key

Digital divides

- whose voices are
represented?



Take-Home Messages

Consider All Costs

All phases of app deployment

- Design & troubleshooting
- Hosting (Apple, Google)
- Software updates
- Marketing

Data analysis

Opportunity costs for
volunteers



Take-Home Messages

Evaluate App Builders

Build app from scratch

Build from a template

- ESRI Web AppBuilder
- Open Data Kit
- Spotteron
- Siftr

Connect to an existing project

- iNaturalist
- eBird
- CitSci.org
- Anecdata





Thank you!

Please get in touch with questions!

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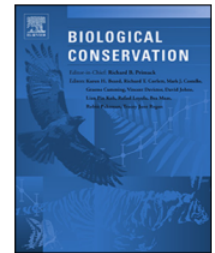
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Contents lists available at ScienceDirect

Biological Conservation

journal homepage: www.elsevier.com/locate/biocon



Review

Smartphone technologies supporting community-based environmental monitoring and implementation: a systematic scoping review

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ABSTRACT

The prospect of leveraging new technologies for community-based environmental monitoring has captured the imagination of many scientists, policy makers, and conservation professionals. This systematic review examines the state of knowledge and trends in the peer-reviewed literature related to the use of smartphone technologies for community and citizen science environmental monitoring. We organize our findings in relation to data collection and data handling, the process of developing smartphone applications, and the ways that outcomes are reported. While the literature is nascent and technological advances are continually opening new opportunities, it is notable that there is limited scholarship that explicitly connects the monitoring function of smartphones to tangible conservation action (e.g., only 10 percent of the papers analysed data collected by smartphones, let alone making connections to required actions or policy). We discuss two central implications in terms of research-implementation spaces for environmental monitoring with smartphones: (1) what we identify as the cost paradox, the lack of recognition of actual costs of app development, monitoring, and implementation; and (2) the need to center the role of people and partnerships in order to ask more precise questions about outcomes for app users and conservation impacts from data collection. We conclude with a call for more research on costs and actual impacts, documentation of factors that lead to successes and failures, and how digital divides influence conservation outcomes. Our intent is not to call into question the potential impacts of smartphone technologies, but to encourage further understanding of how and when they can be most useful.