Evolving Evaluation: Exploring new measures to assess the impact of end-market interventions to address harmful wildlife trade

*by Gayle Burgess
and Steven Broad*

There is an urgent imperative to improve insights into the impacts of end market interventions aimed to reduce illicit trade in wild fauna and flora. Based on a value chain approach to the representation of wildlife trade flows, participating actors and potential interventions aimed to reduce harms and increasing benefits, a range of possible reference points for monitoring and evaluation can be identified. Sixteen datapoints specifically relevant to evaluation of the impact of end market interventions have been assessed in terms of utility and viability, with four of them emerging as the most important. These include consumer opinion indicators (self-reported past purchase rates and predicted future purchase intention) and retail observation indicators (product sales volume trend, and retail price).

The use of these and other indicators in assessment of intervention impacts within the largely legal diamond industry and the illegal cocaine trade is reviewed to gain insights into both utility and viability. Based on the insights derived from this comparison, opportunities and challenges in relation to further development of these evaluation approaches for assessment of wildlife trade interventions in end markets are reviewed.

Orientation and Overview

Trade in wild animals and plants for a wide range of market uses is a major driver of the over-exploitation of wild species, the second most significant cause of global biodiversity loss (IPBES, 2019). Efforts to address this conservation threat through local and international action have increased steadily over the past 50 years, particularly under the auspices of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). However, during this same period there has been a massive increase in market access and demand for many wildlife commodities, as a result of globalisation, population and economic growth (UNODC, 2020).

Recognition of this situation has stimulated a surge in conservation action to tackle over-exploitation, especially in the past decade, but even with some increase in available resources hard choices still have to be made about the application of finite funding and effort across interventions to reduce harmful wildlife trade. The importance of robust methods to gain insight into market trends and evaluate the impact of social and behaviour change interventions within this frame is recognised as fundamental yet challenging. With considerable regulatory pressure on many components of wildlife trade a sizeable proportion of the business operates illegally and out of sight. This is compounded by the markets for many species being complicated with multiple potential sources

of supply, complex transport, storage, and processing routes, and differentiated end uses. Intervention impact assessments are especially challenged by poor access to market info and multifaceted dynamics.

Value Chain Analysis (VCA) is a useful tool through which to address such challenges. It can help characterise trade flows for different wildlife commodities; understand diverse roles and connections between participating actors; identify new approaches to reducing harms and increasing benefits; improve evaluation methods and maximise intervention impacts (Fasse *et al*., 2009). As part of a wider effort to enhance the application of value chain thinking in the wildlife trade field, this paper focuses on how VCA might strengthen end-market insight, "demand reduction" (DR) impact assessment, and the effectiveness of efforts to influence consumption behaviour.

TRADITION AND NEW TRACTION

In line with strategies to combat other illicit commodity markets—such as narcotics, weapons, or counterfeit products—traditional conservation approaches to addressing harmful wildlife trade have focused on supply disruption and mitigation (e.g. UNODC, 2016; Burgess *et al*., 2018). Effort has been made to enact trade restrictions and then ensure such laws were better enforced and carried stronger penalties and deterrents, whilst information has been gathered on trade routes and smuggling methods to increase interdictions and seizures. Public engagement has featured less prominently and focused on mobilising public sympathy for endangered animals, calling for policy changes or raising awareness of laws (Burgess, 2016).

More recent initiatives in wildlife end-markets have started also to focus on complementary actions, aiming to reduce consumer desire for illegally traded products. The theory of change is that by reducing consumer desire for illegal wildlife products such incentives for traders diminish, while parallel efforts to increase the effort and effectiveness of law enforcement will increase the costs to e.g. conceal contraband and avoid detection along smuggling routes. Strong consumer desire and lucrative values for pachyderm, pangolin, big cat, reptile and tropical hardwood products, combined with the potential campaign appeal for "charismatic species", has catalysed an early focus on these taxa in DR efforts.

The skillset—and to some extent mindset—required to gather behavioural insight, target communications accurately and measure the impact of such communications, is quite new. Recent emphasis by donors and in policy priorities such as the CITES Resolution on Demand Reduction (Resolution Conf. 17.4) is successfully encouraging practitioners to diversify and complement classic public awareness campaigns with more nuanced social and behaviour change communications and actions. These seek to promote specific changes in purchasing preferences and buyer desires. Ensuring these employ the best evidence around wildlife end-market trade volumes and flows, commodity prices and consumer motivations, is critical

to building further success and impact. As a precursor to explaining how VCA can help meet this requirement, this paper first considers DR current practice and some perspectives and commentary around it.

PERSPECTIVES ON CURRENT PRACTICE

Early efforts to gain insight into consumer buying behaviour and motivations in wildlife end-markets have used social surveys. These surveys have typically incorporated qualitative and quantitative components across nationally representative samples—up to 2,000 people in selected urban centres in China, for example. Surveys of this type can provide useful socio-economic and psycho-demographic evidence to underpin baseline and formative assessment. Data of this type have so far been gathered around pachyderm, pangolin and big cat product consumption in China, Thailand and Viet Nam, with smaller datasets for species such as saiga antelopes, sharks, orchids and exotic pets.

While these surveys have provided valuable consumer insight of great use to designing behaviour change interventions, limitations are recognised in their applicability to DR initiative impact assessments and broader understanding of market dynamics. Extensive commentary has been published on this topic, including in Roberton, 2014; TRAFFIC, 2017; U.S GAO, 2017; Olmedo, *et al*., 2017; CITES, 2017; Burgess *et al*., 2018; Verissimo and Wan, 2018. A synthesis of the key point is that self-reporting of past purchase and future purchase intention can be unreliable. For example, in research conducted by IPSOS Viet Nam in 2013, 5% of survey respondents reported previously consuming rhino horn, and in 2017, only 2% did. In the same 2013 study, 16% indicated they were considering purchasing rhino horn in the future, and in 2017, the figure was 9%. While at face value, the latter could be a positive sign of progress in reducing demand for rhino horn in Viet Nam, the literature calls into question how practitioners and donors can rely on such data if surveys aren't designed using appropriate methods, or without triangulating what people claim against more observable/less subjective insights. While constructive criticism is important for progress, some commentary has led to scepticism over whether DR is a worthwhile investment for efforts to combat wildlife trafficking at all (see Holden *et al.*, 2018, for further discussion on this matter).

Experience from other fields of social survey application support the need for caution (e.g. MacFarlane *et al*., 2020). In medicine, the risks associated with over-relying on such "opinion-based" data as a measure of impact, are well documented. Illustrative was one study on arthroscopic knee surgeries, which demonstrated that the amount of pain relief described by patients was consistent irrespective of whether they received a real or "sham" treatment (either saline wash, or simply an incision with no further surgical intervention) (Moseley *et al*., 2002). This illustrates the placebo effect (Althubaiti, 2016), but also potentially an "illusion of causality" and "causal inference" (Matute, 2015), which all surveys should design for adequately.

SENSITIVE SURVEY SUBJECTS

Shortcomings such as this are exacerbated around topics that are sensitive, illicit, or subject to social (or legal) sanction. Human nature suggests people report being morally more wholesome or upstanding than their actual behaviour might justify. Compounding this, respondents may deliberately misreport information on sensitive subjects, to maintain their reputation or abide by relevant norms (Gilens *et al.*, 1998; Rosenfield, *et al.*, 2016). Cognitive dissonance (when an individual holds contrasting beliefs, attitudes or values: Festinger, 1957), may also factor.

By way of illustration: Most survey respondents would claim climate change, biodiversity loss and animal cruelty are a concern and influence their purchasing decisions (Burgess *et al.*, 2018). But when confronted with a product sold in a luxury retail environment, sanitised from any such impacts arising from product sourcing, processing, manufacture and distribution, a mental justification is made that e.g. an ivory product is distant from the elephant poaching crisis. Further complications occur through a perceived lack of personal agency (a behavioural science term for a person's belief of their influence, contribution or control around the outcome) around the problem ("my behaviour doesn't really make a difference to the elephant poaching crisis anyway, so why shouldn't I buy that beautiful ivory bangle. I deserve/desire it as a treat/souvenir/memento from my holiday").

Beyond such common-sense considerations around "denial" and the influence of shame and illegality on what people say or predict about their behaviour in social surveys, additional psycho-social factors (that influence what people believe they will do, thus compounding any response bias) are also worth noting. Examples include preference falsification (the tendency for people to conceal what's in their head); hedonism trumping values (the fun of the moment outweighing usual moral or ethical reservations, so what people say at the time of engaging in the survey may not be what they do in the moment); and hyperbolic discounting (the prospect of current gains outweighing fear of future losses). Kormos and Gifford (2014) explore elements such as these further.

MORE APPROPRIATE METHODS?

Methodological approaches are available to help reduce the impact of such factors in social surveys. Sensitive questioning techniques, question phrasing, timing, order and the use of proxies are all relevant and discussed further in TRAFFIC, 2017; MacFarlane, 2019 and Walsh and Vogt, 2018. However, an adequate amount of funding, time, knowledge, and skills are required to implement these approaches adequately. This confluence of challenges in the use of social surveys for DR impact assessment specifically has led to a paucity of reliable data. Current measures tend to focus on a mix of self-reported past 3-, 6- and 12-month purchase practice plus expressed future intention—if data have been gathered at all—and there is no comparison between treatment and control groups. More typical types of "evaluation" include outreach and pledges.

In their meta-analysis of 236 DR initiatives, Verissimo and Wan (2018) observed that:

"*37% reported some information on their inputs, 98% on strategies (tactics and approaches adopted to achieve change), 70% on outcomes (defined as changes in the target audience) and 9% on impacts (biological changes or threat reduction). Information on outcomes and impacts was largely anecdotal or based on research designs that are at a high risk of bias, such as pre-post comparisons. At present, it is challenging to know whether demand reduction campaigns are having a direct behavioural or biological impact.*" (see Figure 1).

Despite consensus and excoriating commentary around these challenges for DR initiative insight and impact measurement, plus the broader implications for wildlife end-market evidence, surprisingly little has been put forward by way of solutions. Looking to value chain analysis in other fields of commodity trade, end-market interventions are often appraised against a wider set of indicators, including retail sales information as well as consumer surveys. Opinion-based data are also typically triangulated with those from observation and contextualised against wider market analytics. The paper thus next delves into these aspects deeper.

DISCERNING "DEMAND" DATAPOINTS

Figure 2 below illustrates a simplified wildlife commodity value chain, while Figure 3 summarises the datapoints associated with these components and clusters them according to whether they are opinion or observation based, and further details on each appears in Table 1. All datapoints would be equally relevant to any taxa, geography, or wildlife trade type. Interlinkages between the datapoints exist but are set-aside for now, as are additional options falling outside this classification (e.g. social listening/public norm narratives).
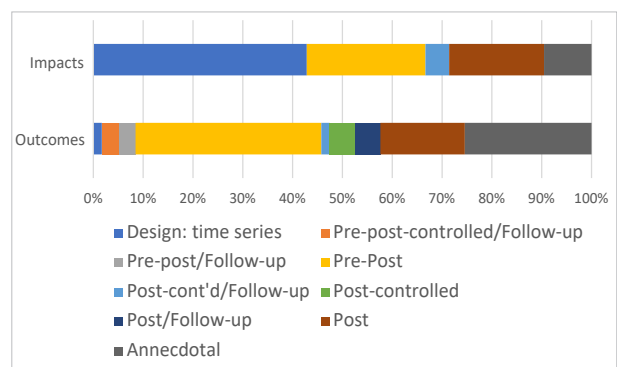
Fig. 1: Research design of wildlife DR initiatives mapped by outcomes and impact. Source: based on Verissimo and Wan, 2018, reproduced with permission.

RATIONALISING FOR PRACTICALITIES

Collecting research data from all 16 datapoints in Figure 3 and Table 1 is infeasible, considering DR practitioners are still building the skillset required to gather behavioural insight, target communications accurately and adequately measure their impact. Some prioritisation of the most crucial elements for those aiming to reduce harmful wildlife trade in end markets therefore needs to be prepared. The three 2x2 analyses illustrated by Figures 4–6 thus aim to inform considerations around that, with further discussion around the key points as follows:

1) Considering the data that are technically most useful in terms of the quality of insight

Figure 4 proposes priorities from among the initial 16 datapoints according to which datapoints offer the potential for unique insight and something technically useful, in the authors' experience and opinions. Three datapoints from consumer opinion data remain following this initial filter, whilst two datapoints from all other clusters are removed/remain. Unifying features for the resultant nine datapoints include direct measurement of the commercial transaction between retailer and consumer in the opinion data, with more indirect measures against which these can be triangulated in the
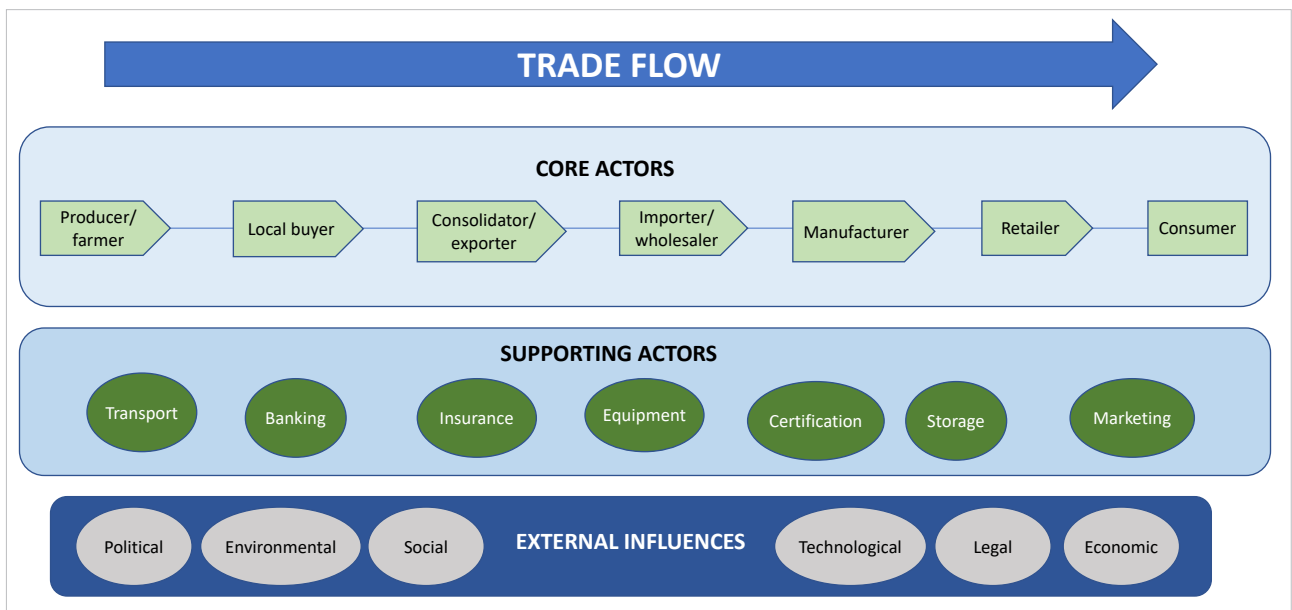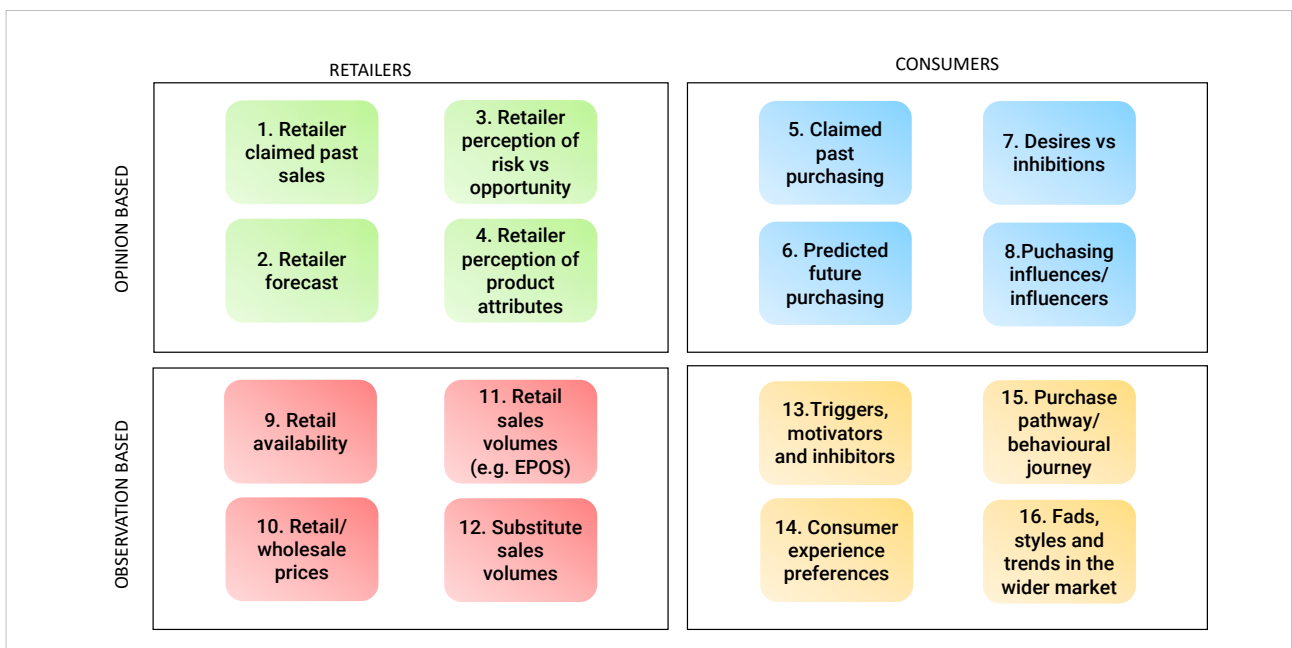

Fig. 2: A simplified Value Chain.

Fig. 3: Potential datapoints for end markets for illegal wildlife trade.

Table 1. Potential datapoints for end markets for illegal wildlife trade.

| No.	Datapoint	Data source	Examples/further explanations
1	Retailer claimed past sales	Retailer opinion data	Qualitative data providing insight into the retailer experience of consumer demand, ideally factors such as how "easy" product is to acquire, supply time lag, overheads for illegality, how they sell products, etc.
2	Retailer forecast		Insight into how retailers predict future demand, what factors they consider, how far in advance they forecast and if they stockpile.
3	Retailer perception of risk vs opportunity		Qualitative assessments of how retailers weigh-up the risks and benefits of trading in illegal wildlife products: influences might include perception of laws, penalties and effectiveness of enforcement efforts.
4	Retailer perception of product attributes		Understanding on the categories of use retailers bracket the illegal wildlife product into: examples include health products, luxury goods, furniture, fuel, food or others.
5	Claimed past purchasing	Consumer opinion data	How frequently (and ideally in what quantity) self-confessed "buyers" report purchasing the target wildlife commodity over the past 3/6 or 12 months, 3 years or "ever."
6	Predicted future purchasing		The proportion of respondents in the survey, predicting their intention to buy the target wildlife commodity in the future. Usually on a Likert scale e.g. "very likely; likely; neither likely, nor unlikely; unlikely; very unlikely."
7	Desires vs inhibitions		Consumer expressions around the illegal wildlife products (or their equivalents) they desire, and the factors dissuading/encouraging that desire.
8	Purchasing influences/influencers		Information from consumers (actual buyers, whether lapsed or not, and "intenders") about who their "social referents" are: the public figures, family members, friends, peers and others, that influence their behaviour, plus outreach channels.
9	Retail availability	Retailer observation data	Market monitoring data for the number of illegal products in adverts for sale, and number of offers for sale, in how many outlets, of what type: measured routinely over time (e.g. monthly in virtual markets/bi-annually in physical markets).
10	Retail/wholesale prices		Retail price easier to obtain than wholesale, although both should be gathered routinely and applicable to a weight category e.g. USD4.70 per gramme for ivory in 2017.
11	Retail sales volumes		Identifying trend data around how much (i.e. what volume) of product is being sold through retail outlets over time. Identified through sampling, Electronic Point of Sale (EPOS) records.
12	Substitute sales volumes		Where substitute products are identified, understanding how much of these are being sold through retail outlets over a fixed period (e.g. 50 kg per year). Hard to acquire.
13	Triggers, motivators and inhibitors	Consumer observation data	Insight from in depth ethnographic studies, such as social listening, consumer forum discussions or transaction observations, to understand what situational triggers prompt consumers to buy products at that place/ on that day; for example, looking at the narratives around their queries to understand what they seek to determine the best buying experience and quality product; looking at the tagwords associated with their choice of purchase.
14	Consumer experience preferences		Insight from similar sources to those above, around how consumers determine quality of product, whether they would prefer e.g. wild sourced or farmed, product from Africa or Asia, the elements they value in their purchase experience, etc. Examples include exclusivity, privacy, price competitiveness, trust in receiving an authentic product, etc.
15	Purchase pathway/behavioural journey		How consumers progress from one-off or occasional purchases of illegal wildlife products, to those more routine or habitual. Methods of collecting and compiling data would include in-depth ethnographic analysis and observation with a few representative test subjects with whom trust is built over time to acquire a more "natural"/honest insight.
16	Fads, styles and trends in the market		Social listening (monitoring specific social media channels for mentions of keywords, hashtags or other indicators associated with consumption of the wildlife product in question) and consumer forum data to understand which illegal wildlife products are more susceptible to ebbs and peaks in demand, and what factors drive those.
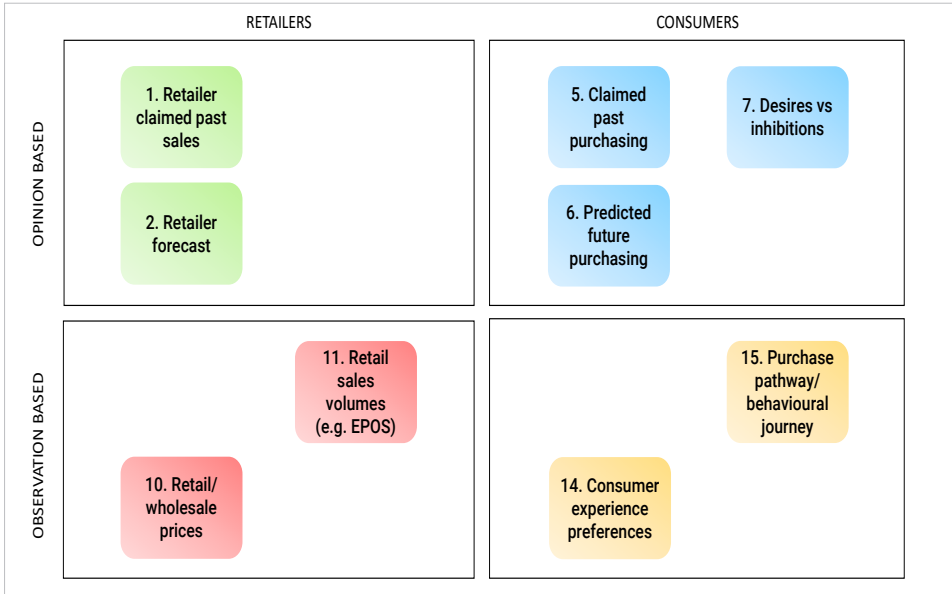
Fig. 4: Initial shortlist of the datapoints offering insight that is unique and potentially useful.
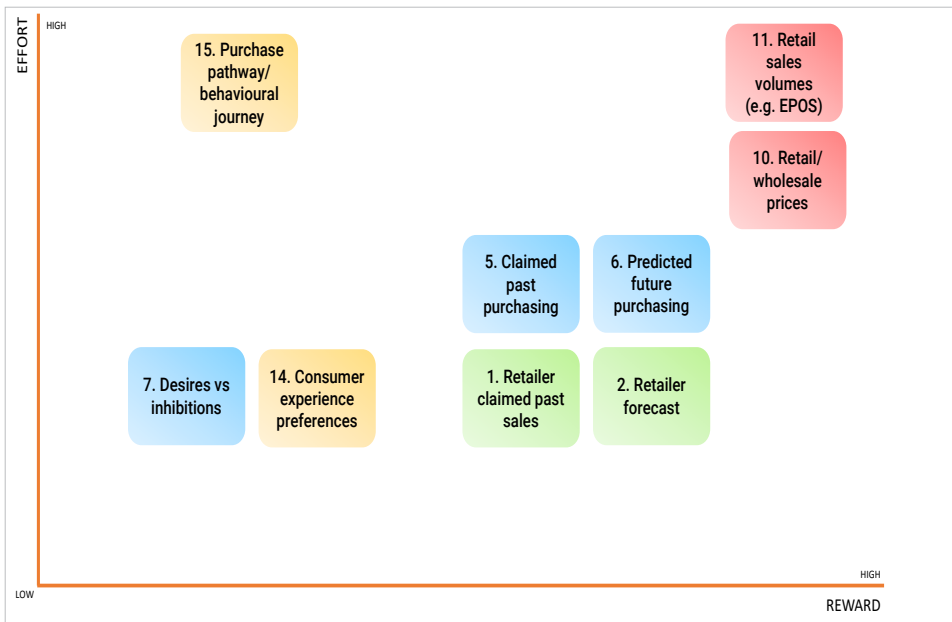

Fig. 5: Rough assessment of how much effort is involved in gathering the data and reward (i.e. how useful the insight arising might be).
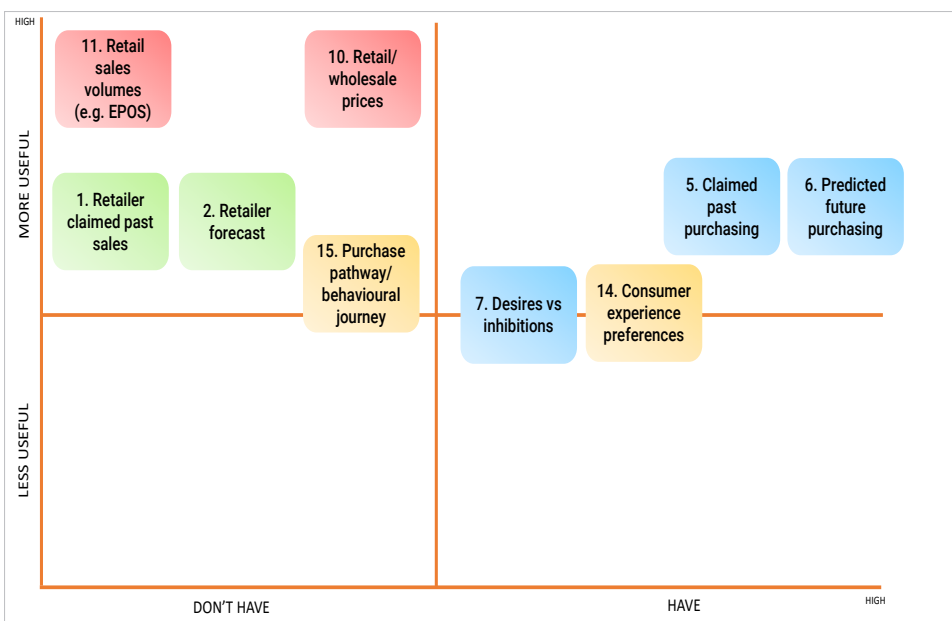

Fig. 6: Mapping data utility against current availability.

observation data. This reflects difficulties in directly observing the actual purchase of illegal wildlife products and emphasises the importance of social survey methods that can adequately ensure the veracity of the opinions retailers and consumers reveal.

2) Considering effort vs reward in gathering these data

Building on this initial "quality" assessment, Figure 5 then considers the effort involved in securing the data. Despite the aforementioned challenges, the process of gathering opinion data through social surveys is generally easier, but not necessarily less expensive, than the equivalent process for gathering observation data; this is due largely to the inherently clandestine nature of IWT and the difficulty of systematically observing trade transactions. The increasing predominance of IWT online suggests companies, including partners in the "Global Coalition to End Wildlife Trafficking Online", might be able to help address this, in turn improving the return on effort invested to gain the retail observation data of wildlife product throughput/"flow" and price.

Any price data at all are helpful, although wholesale price may reflect more transitions in value along the trade route, rather than retail price which may fluctuate more with local factors. The consumer observation data associated with behavioural journey mapping are another clear outlier in Figure 5, being difficult to generate and less useful than other data in determining shifts in demand and equivalent dynamics. By comparison, claimed past purchase rates and predicted future intention by retailers and consumers cost markedly less effort for better returns.

3) Considering data needs and availability

Figure 6 finally considers the datasets that are held against those the previous two filters have indicated would provide the greatest reward or utility. Assessments of what is available are based on the authors' direct experience, as well as data provided by the Social and Behaviour Change Community (using www.changewildlifeconsumers.org), and systematic reviews such as those in Verissimo and Wan, 2018. Five datapoints are clustered in this quadrant overall. The remaining four datapoints are all deemed available and relate to consumer data specifically. Two of these (claimed past purchasing and future predicted purchasing) are both desirable and opinion oriented. The final two (desires vs inhibitions to purchase, and consumer experience preferences) are a mix of opinion and observation data (respectively) but straddle the divide between data desired and undesired. This reflects the analysis in Figure 5, where these two datasets seemed to show the least "reward" for the effort involved.

ESTABLISHING PRIORITIES

Based on the preceding observations, four datapoints emerge as potentially having the greatest utility. Two are consumer and opinion focused (claimed past and future purchase intention); and another two are retailer and observation focused (retail sales volumes/trends in flows and price). The two consumer opinion-based indicators, unsurprisingly in light of preceding commentary, are judged to require less effort and to have better existing data availability than the retail-based indicators. However the retail observation indicators offer a premium in terms of potential analytical reward.

Beyond these four priorities, the two retail opinion-based indicators of claimed past and predicted future sales are judged to offer lower reward and worse existing data availability. The consumer opinion indicators of "desires vs inhibitions" are judged to have quite different levels of required effort, but overall lower reward and limited data availability.

The result of this analyses therefore suggests that of the original 16 datapoints covering retailer and consumer actions and perspectives in wildlife end markets, the following offer the greatest utility and potential return on investment:

- **Consumer opinion indicators:**
5. Claimed past purchasing
6. Predicted future purchasing

- **Retail observation indicators:**
10. Wholesale/retail price
11. Retail sales volumes

In light of this finding, the paper next explores case studies in end-markets for non-wildlife products, to discern how these datapoints—summarised hereafter as consumer desire, product flow and price—can provide insight into demand dynamics and support DR impact and other types of evaluation in end markets.

DATAPOINTS AND DIAMONDS

Like some other precious stones (such as jade), diamonds can provide a useful proxy for some wildlife products being consumed for similar motivations. Jewellery containing diamonds is bought for tradition (in engagement/wedding rings), auspiciousness, financial and aesthetic value, art, auction, collection, and investment, or simply as an overt display of wealth or status. These motivations are also true for those buying red corals or elephant ivory earrings, pendants, bracelets, and bangles. In research into Chinese ivory buyers conducted in 2019 by Globescan, 24% of all social survey respondents identified diamonds as a "suitable alternative to ivory products", whilst at the same time eliminating mammoth ivory despite its structural and aesthetic similarities (Globescan, 2019).

Although the diamond industry value chain is more straightforward than many for wildlife commodities being vertically integrated, useful insights arise from this corollary of motivations as it is one of the most heavily analysed chains globally due to its economic significance yet vulnerability to market volatility. Over the past 50 years various psychosocial, macroeconomic, and geopolitical shocks have either disrupted, diluted, or

diverted consumers' discretionary spending on diamonds. Ethical concerns over human rights abuses in the supply chain and desire to avoid so called "blood diamonds," have also driven substantial changes to mining industry practices and "pipeline" transparency. Buyer desire for "conflict-free" diamonds has stimulated a market for lab-grown synthetic products (analogous to what has been tried with synthetic rhino horn products), which after a decade long development period are now finally starting to compete with mined "natural" products on price—last year, almost 20% of polished diamonds purchased globally had been grown in a Chinese or Indian lab.

The Antwerp World Diamond Centre (AWDC) commissioned Bain & Company to collaborate with them in producing a "Global Diamond Industry" report for 2019. This reinforced the central role that data for consumer desire, product flow and price play in characterising insight and "impact" in vibrant end-markets for this non-wildlife commodity. For example:

"Near record-high rough diamond production in the beginning of 2019 was followed by lower-than expected demand for polished diamonds, causing a ripple effect through the supply chain. The softer demand for polished diamonds was driven by two major factors: geopolitical and macroeconomic tension lowered consumer confidence and thus demand, and an increase in e-commerce created efficiencies in the supply chain that decreased the need for inventory on hand ... softer demand for polished diamonds led to a 3% drop in polished prices and is expected to lead to 10% to 15% lower revenues for midstream players. The slowdown resulted in some of the lowest profit margins experienced in years, as well as high inventory levels, which have been accumulating since 2017."

Of particular note in Bain's comprehensive analysis is the clarity of the relationship between fluctuations in consumer demand; the knock-on effects to the volume of diamonds held by "mid-stream" actors as inventory or flowing from producers through the pipeline to retailers; and volume or price adaptation strategies made by wholesalers/brand managers to protect profit margins.

Per Figure 7: Bain identified a 2% reduction in consumer demand for diamonds globally in 2019, linked primarily to changes in the two main markets of China and the US. Reduced consumer confidence and this "softening of demand" was attributed to a range of psychosocial and geopolitical factors, including increased concern about social and environmental issues and reduced tourism by Chinese consumers. This led to a reduction in luxury product spending, exacerbated by the US-China trade war in which a 15% tariff had been applied to all Chinese jewellery imported into the US.

Consequent adaptations by value chain actors featured technological innovation to adjust for social and environmental factors, and blockchain modelling to increase traceability. Producers also reduced the flow of diamonds into the market by 25%, while rough diamond prices fell by 7%, and by 3% for their polished equivalents. Mining companies applied a "volume rather than price" strategy, and either withheld supply/ stockpiled raw materials or reduced resource extraction.

Of additional interest in this review was coverage of the most catastrophic economic "crises" punctuating diamond trading during the past 50 years. Per Figure 8, insight and impacts were once again largely characterised through a focus on consumer desire, product flow and price. The 2008/9 global financial crisis was illustrative, described as causing a 10% drop in consumer demand, in turn catalysing a 13% drop in rough diamond prices and 2% drop in the price of their polished equivalents. Producers subsequently reduced end-market flow by 50% and manufacturing by 25%. Within 6 months prices started to recover and within 2 years these restored to pre-crisis levels.

While this synthesis of Bain's expansive study is relatively superficial, it reinforces the insight available through a VCA focused on the four datapoints emerging as priorities from the 2x2 analyses—those around consumer past purchase rates, predicted future intention, product flow and price. As data in these domains are clearly tightly woven, easily quantifiable and causal in this legal trade example, it suggests an equivalent effort should be undertaken to triangulate the same data in end-markets for illegal trade e.g. in illegal wildlife products. Doing so could significantly enhance understanding around consumer and retailer actions and perspectives, and boost efforts to identify the factors influencing a safe, sustainable, and traceable supply of wildlife products. The impact DR initiatives can have in influencing those factors could also be revealed. To explore further how, this paper turns next to an illicit commodity: cocaine.

COCAINE COMMODITY CHAINS

According to the 2017 World Drug Report (WDR: UNODC, 2017), more than 5% of the global population aged 15–64 consumed a narcotic in 2015. Drugs represent the largest illicit commodity market globally, worth between USD426–652 billion in 2014 (GFI, 2017)—about one-third of the total retail value of all 11 transnational crimes studied. Cocaine was then the second most trafficked drug (after cannabis and before opiates), but this was prior to a 25% increase in production recorded in 2015/6, which took total output to 1,976 tonnes of pure product. Coca source countries are concentrated in South America, but end-markets are evident everywhere.

As the GFI for 2017 highlights: *"Transnational crime is a business, and business is very good. Money is the primary motivation for these illegal activities. The revenues generated from the 11 crimes covered in this report—estimated between USD1.6–2.2 trillion per year—not only line the pockets of the perpetrators but also finance violence, corruption, and other abuses.*

2019 crisis

Causes
Deterioration of consumer sentiment around the globe due to geopolitical turmoil resulted in decrease of retail demand in 2019
Overstock in midstream driven by both demand softening and +20% rough diamond product in 2017–19

Impact to date*
−7% rough diamond prices   −3% polished diamond prices

Actions
Diamond producers decreased their sales by 25% in 2019
Major producers adopted price over volume strategy reducing rough diamond prices by only −5% but allowing midstream players to postpone up to −55% of their purchases to later periods
Junior producers allowed up to 10% price decrease while maximizing volume sold

Recovery

2019–20
Likely inventory decrease due to contracting rough diamond sales
Production in accordance with mining plans remains high

2021
Planned production levels decrease, leading to a potential improvement of diamond pipeline performance, except for the risk of prolonged economic recession

* Impact on prices is shown as average prices for eight months in 2019 vs 9 months in 2018
Sources: Rapaport; WWW Diamond Forecasts; Kimberley Process company data; expert interviews; Bain & Company
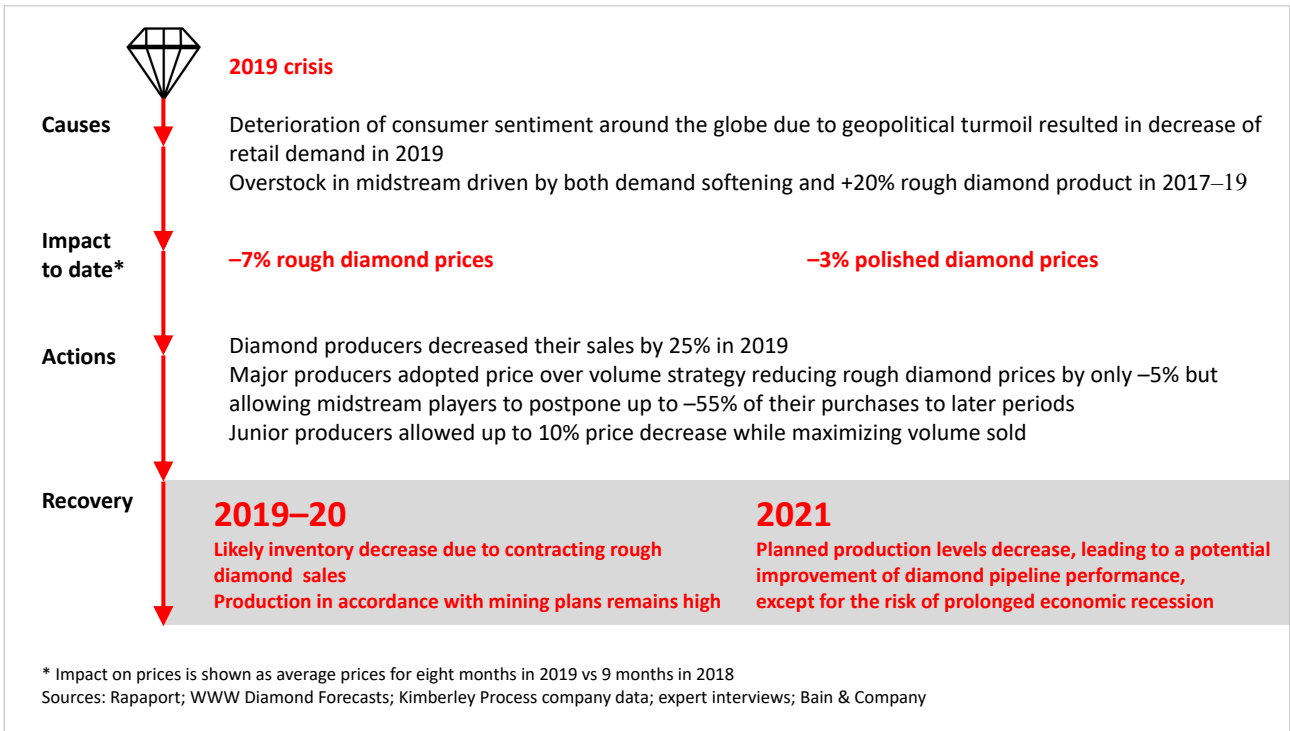
Fig. 7: Graphic Illustrating Bain & Company's Diamond 2019 Value Chain Analysis, the Relationship Between Demand Dynamics and Datapoints in End Markets. Source: Used with permission from Bain & Company, 2019: https://www.bain.com/insights/global-diamond-industry-report-2019/

1980 crisis   **1985 crisis**   **2009 crisis**   **2015 crisis**

Cause
Recession and inflation created a speculative bubble for investment diamonds and midstream asset buildup

Start of mining operations at Argyle let to oversupply of rough diamonds

Global financial crisis caused ~10% decrease in diamond jewellery demand

Lower than expected polished diamond sales with fewer store net openings in Greater China led to overstock in midstream

Impact
−19% rough diamond prices
−60% polished diamond prices

−26% rough diamond prices
−11% polished diamond prices

−13% rough diamond prices
−2% polished diamond prices

−15% rough diamond prices
−4% polished diamond prices

Actions
Investors started selling diamonds investment bubble burst
Midstream destocked following investment sell-off

Mining companies stored part of production in stocks to balance supply and demand of rough diamonds

Rough diamond producers decreased sales by 50% and production by 26%

Rough diamond producers reduced sales by 24%

Recovery
IN 1 YEAR prices started declining
IN 2 YEARS prices restored to precrisis

IN 1 YEAR prices started rising
IN 2 YEARS prices restored to precrisis

IN 0.5 YEAR prices started growing
IN 2 YEARS prices restored to precrisis

IN 2 YEARS prices started growing
IN – YEARS prices have not restored yet

Note: total impact during the crisis, which is 1980–82 for 1980 crisis, 1984–85 for 1985 crisis 2008–9 for 2009 crisis and 2014–15 for 2015 crisis: recovery timing is measured by time of rough diamond price recovery to the precrisis level or long-term trend
Sources: Diamond Trading Company; Rapaport; Kimberley Process; company data; expert interviews; Bain & Company
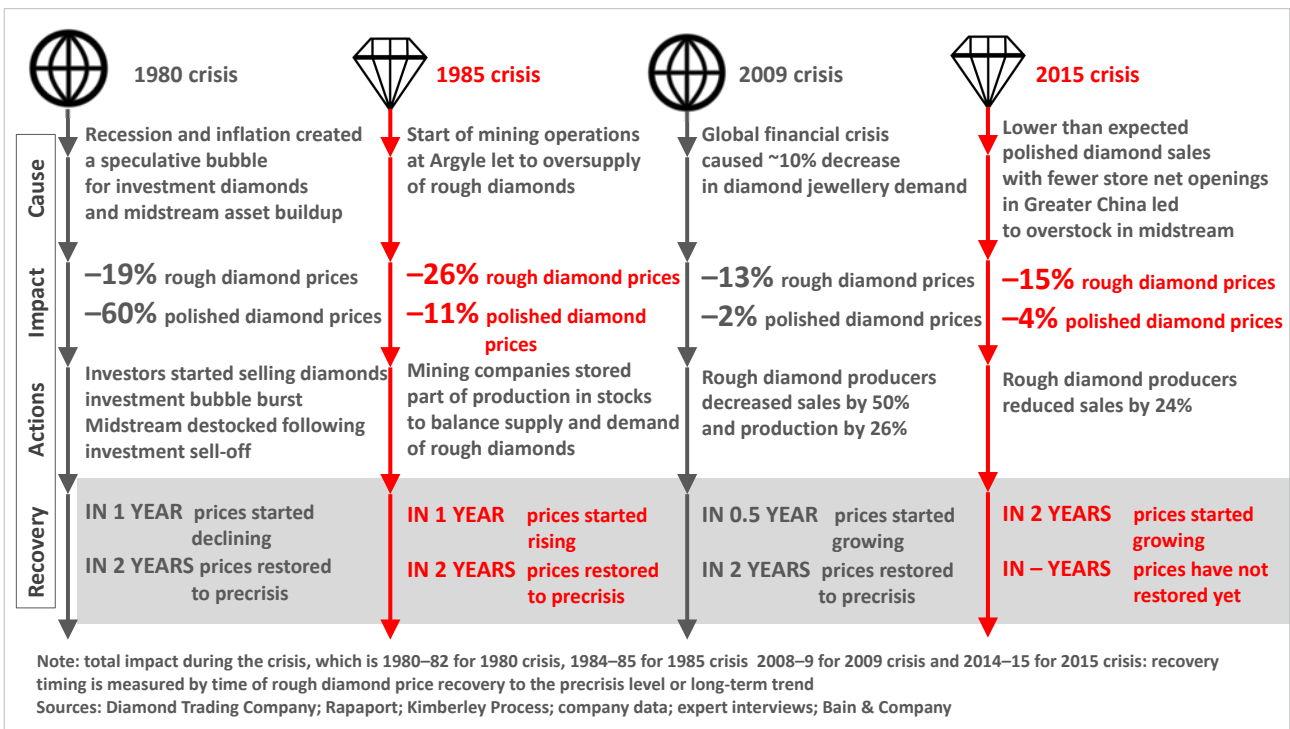
Fig. 8: Graphic Illustrating Bain & Company's Diamond Historic Value Chain Analysis, the Relationship Between Demand Dynamics and Datapoints in End Markets. Source: Used with permission from Bain & Company, 2019: https://www.bain.com/insights/global-diamond-industry-report-2019/

These crimes undermine local and national economies, destroy the environment, and jeopardize the health and wellbeing of the public. Transnational crime will continue to grow until the paradigm of high profits and low risks is challenged.”*

In the same manner that situational crime prevention models are shaping much current counter-wildlife trafficking effort, efforts to reduce the rewards criminals perceive for engaging in cocaine smuggling, also of high fiscal return for low risk, are a core strategy for tackling this pernicious trade harming 35 million people each year (UNODC, 2019). It is thus important to consider what is known of consumer desire, product flow and price for cocaine and how data in these domains are gathered.

For the past two decades cocaine “buyer desire” and data for claimed past/future predicted purchase, has been gathered as part of the annual “Global Drug Survey” (GDS). This monumental piece of research is conducted by an independent company providing data for the WDR. In 2015, the last year for which data are available at no cost, GDS’s social survey was translated into 10 languages and distributed in 30 countries, attaining a sample size of more than 100,000 people. Unsurprisingly, it is the world’s largest study on drug use and users. Consumer opinion data are gathered anonymously online for a wide range of direct and related topics.

Retail observation data are, by contrast, much harder to attain. Caulkins *et al*., 2016 is illuminating:

“*No level of the drug supply chain is easy to study, but there is ongoing data collection about users (e.g., from household surveys and studies of treatment populations) and production (e.g., from satellite imagery). Retailing can be studied by asking users to describe their purchases or by interviewing retailers directly; the nature of their trade requires them to be fairly visible.*”

Researchers from the United Nations Interrogational Crime and Justice Research Institute (UNICJRI) showed in this paper how they adapted their efforts accordingly, when they attempted to model end-markets and transactions between those selling cocaine in Italy using opinion rather than observation data. While limitations arising were acknowledged, valuable insights were nevertheless identified for drug demand and distribution dynamics. Semi-structured interviews conducted with 116 incarcerated volunteers identified how much cocaine they bought to sell, how frequently and at roughly what cost.

A similar approach was evident in Johnson and Golub, 2007, who conducted primarily ethnographic studies and street surveys with those selling and buying heroin, crack and marijuana in New York City, to measure accurately the “Behavioral and Economic Dimensions of Consumption, Prices, and Markets for Illegal Drugs.”

Adapted Approaches

In light of these adaptations in other illicit commodity markets therefore, should a similar approach be adopted in end markets for harmful wildlife trade? Retailer opinion data already featured in four of the original 16 end-market datapoints, but as the results for sales volume specifically were deemed less reliable, they were discarded in the “quality” oriented 2x2 assessment (Figure 4). Offender surveys are however already being conducted with “producers” [poachers] in wildlife value chains (Moneron *et al*., 2020)—can similar techniques be applied at the “demand” end as well?

As discussed in the diamond industry case study, it would be prudent to ensure if such opinion data are gathered, they are triangulated against those acquired using objectively verifiable methods. The effort vs reward ratios underpinning Figure 5 emphasise the potential for the “Global Coalition to End Wildlife Trafficking Online” to help meet this ambition. The precision tracking and targeting capabilities of all 34 global e- and m-commerce and social media companies is unparalleled and could significantly improve the return on effort invested. Further discussion is thus required to explore this accordingly.

Overall, the cocaine case study provides useful pointers as to how the four datapoints prioritised in the three 2x2 analyses could actually be gathered, considering the clandestine nature of some wildlife commodity end-markets. A final point worth emphasising however, is from a study on “Understanding Drug Markets and How to Influence Them” (Wilson and Stevens, 2007). This reinforces the need to triangulate behavioural and market insight, segueing to the next section:

“*This review of studies examining the behaviour of drug dealers shows that they do (sometimes unconsciously) adjust their operations in response to law enforcement strategies and actions, but to a large degree continue to pursue the same principles as any legitimate commodity business—setting of margins, and management of risk. Much greater analysis and understanding of market behaviour is needed if the international law enforcement community is to increase its effectiveness in reducing the harms associated with the illegal market in controlled drugs.*”

Evolutions in Evaluating End-Markets?

The 2x2 analyses and legal and illegal commodity case studies have illustrated the potential for applying VCA to help improve insight and impact assessments in wildlife product end-markets. The VCA datapoints assessed [by the authors] as the most desirable, viable and feasible were clarified as those focused on consumer desire, product flow and price. The means of acquiring data in these domains was identified as involving opinion- and observation-based measures, but specifically which methods would be involved in these measures requires additional expert, stakeholder and donor engagement and discussion.

Table 2. Potential methods to identify wildlife end market consumer desire, product flow and price.

Datapoint	Potential Measures and Method
Consumer desire (self-reported past purchase and predicted future intention) (opinion)	Ethnographic techniques Sensitive questioning techniques in social surveys Identification of [legal] proxies or "equivalent" products Private sector research techniques e.g. Brand attachment & Unmatched count technique (UCT) Social listening and e.g. Google search string trend data
Product throughput (observation)	Specifically observing transactions in market monitoring Acquiring any equivalent to EPOS (Electronic Point of Sale) data Analysing CCTV footage to identify products people walk out of shops with (only available in relation to physical markets) Engaging Global Coalition to End Wildlife Trafficking Online members in identifying solutions through big data analytics
Price (wholesale if possible) (observation)	Ensuring data are gathered systematically as a complement to online market monitoring, and tracked in key indicator markets.

As recognised earlier, the shortcomings of current consumer opinion-focused social survey methods are well documented. Some of the approaches available to help address these shortcomings were identified as including sensitive questioning techniques, the use of proxies and randomised controlled trials (RCTs). The case studies revealed however that while adequate methods in this domain are certainly critical, consumer opinion data alone provide a relatively simplistic snapshot of what are inevitably complex, multi-faceted and ever-changing demand dynamics and trade environments.

To adjust for this, both case studies triangulated data for consumer desire against those for product throughput and price. In the illegal commodity case study specifically, the challenges and adaptations required to gain robust insight in these latter two fields was clear. Table 2 thus aims to provide some initial ideas of methods that might be adopted across all datapoints in end markets for harmful wildlife trade.

Building on this, an additional opportunity exists to evolve evaluations in wildlife end markets by using series data juxtaposing fluctuations in consumer desire, product flow and price, over time. Based on the VCAs studied so far, it is postulated this could help crystallise any statistical relationships or significance between correlative elements, whilst also discerning demand outliers. In turn this could help test the veracity of contributary elements; that is, identify whether consumer opinion data gathered through social surveys for claimed past/predicted future purchasing (using appropriate methods), reconcile adequately or within expected parameters, to retail observation data around product flow/price.

The barriers to delivering this are admittedly substantial. Illustrative are efforts to understand demand dynamics in China's domestic market for elephant ivory since their landmark December 2017 ban. Despite being one of the most studied wildlife end-markets, significant gaps still exist in the evidence for two of the preferred four datapoints—consumer opinion data have been gathered annually to assess ban impact on claimed past/future predicted purchasing, but few systematic assessments have been conducted for companion data on retail observations around ivory flow (rather than seizures or availability/offers for sale) or price.

The reasons for this are twofold: First, how challenging it is to gather retail observation data for illegal wildlife end-markets at all (as highlighted above). Second, how willing those implementing DR initiatives are to invest the time, energy and resources required to gather such data. To some extent this circles back to the realities that the conservation community is still building the skillset—and mindset—required to gather behavioural insight, target communications accurately and adequately measure their impact. However, as both the diamond and cocaine case studies have reinforced, successfully addressing the shortfalls and excoriating commentary around DR impact measurement will require urgent efforts to address these evidence gaps and data shortfalls. This must occur if the hard choices that have to be made about the application of finite funding and effort across interventions to reduce harmful wildlife trade are to be adequately, accurately and appropriately informed.

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Gayle Burgess (corresponding author)
TRAFFIC International
E-mail: gayle.burgess@traffic.org

Steven Broad
TRAFFIC International